ALPINION
MEDICAL SYSTEMS

X-CUBE 70 v1.2

DIAGNOSTIC ULTRASOUND SYSTEM

User Manual

Rev. 2 (ENG)
D/N: 70004758

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Original Documentation

The original document was written in English and published in PDF File.

The English version of the user documentation is intended for the countries of the European Union, North or South America, Asia as well as other worldwide countries where the products are sales and used. In addition, the English version of the user documentation is designed so that the majority of people who are familiar with English can read and correctly understand the instructions.

The user documentation is translated into other languages so that most people who are familiar with languages other than English can read the instructions and understand them correctly. The translated user documentation is intended for users who speak the language of the country where they sell and use the product.

Please note that the authoritative source of information is the English version. If there is any conflict between the translated versions and the English, the latter takes precedence.

Precautions For Use

Be sure to read this manual and fully understand the operation of the product and the relevant safety information before using the product.

- Keep this manual near the product and refer to it when using the product.
- The contents and specifications described in this manual may be changed without notice.
- All important safety information in the **"2. Safety"** should be read and thoroughly understood before operating the unit.
- Be sure to read and fully understand the safety precautions identified by the following flag words and icons which precede the precautionary statement.

WARNING

WARNING indicates that a specific hazard is known to exist which through inappropriate conditions or actions may cause severe or fetal personal injury or substantial property damage.

CAUTION

CAUTION indicates that a potential hazard may exist which through inappropriate conditions or actions will or can cause minor poersonal injury or property damage such as loss of patient or system data.

NOTE

NOTE indicates precautions or recommendations that will help you operate the product more effectively.

- This product is intended for use by, or by the order of, and under the supervision of a licensed physician qualified to direct the use of the device.
- This product is intended for ultrasound diagnosis and cannot be used in your PC environment. We are not responsible for any problems that occur in such situations.

Regulatory Requirements

Classifications

- Type of protection against electrical shock: Class I
- Degree of protection against electrical shock (Patient connection): Type BF equipment
- Degree of protection against harmful ingress of water: Ordinary equipment and all of applied parts (IPX7, IPX8) except ECG meet ingress protection level according to IEC 60529.
- Degree of safety of application in the presence of a flammable anesthetic material with air or with oxygen or nitrous oxide: Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
- Mode of operation: Continuous operation

Electromechanical safety standards met

- MDR 2017/745
- EN ISO 10993-1:2009 (ISO 10993-1:2009)
- EN ISO 10993-10:2013 (ISO 10993-10:2010)
- EN ISO 10993-5:2009 (ISO 10993-5:2009)
- EN ISO 13485:2016 (ISO 13485:2016)
- EN ISO 14971:2019 (ISO 14971:2019)
- EN ISO 15223-1:2021 (ISO 15223-1:2021)
- EN 1041:2008+A1:2013
- EN 55011:2016+A1:2017 (CISPR 11:2015/AMD1:2016)
- EN 55032:2015 (CISPR 32:2015)
- EN 60601-1:2006+A1:2014 (IEC 60601-1:2005/AMD1:2012/COR1:2014)
- EN 60601-1-2:2015 (IEC 60601-1-2:2014)
- EN 60601-1-6:2010+A1:2015 (IEC 60601-1-6:2010/AMD1:2013)
- EN 60601-2-37:2008+A11:2011+A1:2015 (IEC 60601-2-37:2007/AMD1:2015)
- EN 61000-3-2:2014 (IEC 61000-3-2:2018)
- EN 61000-3-3:2013 (IEC 61000-3-3:2013)
- EN 61000-4-11:2004 (IEC 61000-4-11:2004)
- EN 61000-4-2:2009 (IEC 61000-4-2:2008)
- EN 61000-4-3:2006+A1:2008+A2:2010 (IEC 61000-4-3:2006/AMD2:2010)

- EN 61000-4-4:2012 (IEC 61000-4-4:2012)
- EN 61000-4-5:2014 (IEC 61000-4-5:2014)
- EN 61000-4-6:2014 (IEC 61000-4-6:2013)
- EN 61000-4-8:2010 (IEC 61000-4-8:2009)
- EN 62304:2006+A1:2015 (IEC 62304:2006/AMD1:2015)
- EN 62366-1:2015 (IEC 62366-1:2015)
- MEDDEV 2.12/2 Rev.2
- MEDDEV 2.7.1 Rev.4
- NEMA UD2:2004 (R2009)
- Medical Devices Regulations (SOR/98-282)
- 의료기기법, 의료기기법 시행령, 의료기기법 시행규칙

Contact Information

Sales or customer service representatives are available regionally to help answer your questions. For additional information or assistance, please contact your local distributor or Alpinion representative.

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CE 2460

This product complies with regulatory requirements of the following European Medical Device Regulation 2017/745 concerning medical devices.

Revision History

The revision history of this manual is as follows.

Rev	Date (YYYY/MM/DD)	Description
Rev. 0	2022/07/08	Initial Release
Rev. 1	2022/08/31	Updated for Rev.1 release
Rev. 2	2022/09/30	Updated for Rev.2 release

Please verify that you are using the latest revision of this document. If you need to know the latest revision, contact your local agent or local Alpinion sales representative.

Table of Contents

1

Introduction

This chapter describes the information concerning indications for use, contraindications, and how this documentation is organized.

Overview

This user manual is intended to assist you with the safe and effective operation of your system. Before attempting to operate the system, read this manual and strictly observe all instructions.

Keep this manual with the system at all times. Periodically review the procedures for operation and safety precautions.

Disregarding information on safety is considered abnormal use.

Not all features, products, transducers, or peripherals described in this manual may be available or cleared for sale in all markets. Please contact your local Alpinion representative to get the latest information.

Documentation

CAUTION

Safety instructions must be reviewed before operating the unit.

X-CUBE 70 documentation consists of various manuals:

- The User Manual (TRANSLATED) provides information needed by the user to operate the system safely. It describes the basic functions of the system, safety features, operating modes, measurements/calculations, transducers, and user care and maintenance.
- The Quick Guide/Online Help (TRANSLATED) provides information needed by the user to perform an ultrasound exam step-by-step.
- The Reference Manual (ENGLISH ONLY) contains data tables, such as Obstetric and Cardiology references.
- The Service Manual (ENGLISH ONLY) supplies block diagrams, lists of spare parts, descriptions, adjustment instructions or similar information which helps qualified technical personnel in repairing those parts of the system which have been defined as repairable.

The X-CUBE 70 manuals are written for users who are familiar with basic ultrasound principles and techniques. They do not include sonographic training or detailed clinical procedures.

NOTE

- The manuals are provided in electronic format on the USB flash memory media.
- The USB flash memory media includes English and all translations.
- The screen images in this manual are only for illustrational purposes. Actual screen display may differ slightly from that shown in this manual.

Indications for Use

The X-CUBE 70 diagnostic ultrasound system is intended for use by, or by the order of, and under the supervision of, a licensed physician who is qualified for the evaluation of soft tissue and blood flow in the clinical applications of Fetal; Abdominal(renal & GYN/pelvic); Pediatric; Small Organ(breast, testes, thyroid); Neonatal Cephalic; Adult Cephalic; Trans-rectal; Trans-vaginal; Musculo-skeletal(Conventional); Musculo-skeletal(Superficial); Cardiac(adult& pediatric);Trans-esoph(Cardiac), Peripheral Vessel(PV); and Urology(including prostate).

And, the imaging modes are 2D(B) mode; Harmonic mode(HAR); M mode; Color M mode; Anatomical M mode; Color Flow Doppler(CF) Mode; Power Doppler(PD) Mode; Directional PD mode; Pulsed Wave Doppler(PWD) Mode; Continuous Wave Doppler(CWD) Mode; High PRF Doppler mode; Tissue Doppler Imaging(TDI) Mode; 3D/4D mode.

The X-CUBE 70 is intended to be used in a hospital or medical clinic.

Intended Use

The X-CUBE 70 is intended for use by a qualified physician for ultrasound evaluation.

Operator Profile

The X-CUBE 70 is intended for use by a qualified and trained physician or sonographer with at least basic ultrasound knowledge for ultrasound evaluation.

The operator must have read and understood the user manual.

Contraindication

Do not operate the system for an ophthalmic purpose or any use affecting the patient's eye by the acoustic beam.

Prescription Device

United States law restricts this device to sale or use by, or on the order of a physician.

2

Safety

This chapter describes the safety and regulatory information relevant for operating this ultrasound system.

Safety Precautions

You should make sure the safety precautions during all phases of operation, service, and repair of the X-CUBE 70 ultrasound system. If you fail to comply with these safety precautions or specific warnings in this manual, you violate safety standards in terms of design, manufacture, and intended use of this system. ALPINION MEDICAL SYSTEMS Co., LTD. does not have liability for your failure to comply with these requirements.

Precaution Levels

You can view various levels of safety precautions on your equipment, and each level of caution can be identified by one of the following flag words and icons which precede the precautionary statement.

WARNING

WARNING indicates that a specific hazard is known to exist which through inappropriate conditions or actions may cause severe or fetal personal injury or substantial property damage.

CAUTION

CAUTION indicates that a potential hazard may exist which through inappropriate conditions or actions will or can cause minor personal injury or property damage such as loss of patient or system data.

NOTE

NOTE indicates precautions or recommendations that will help you operate the product more effectively.

Patient Safety

The precautions listed can seriously affect the safety of patients undergoing diagnostic ultrasound examinations.

Patient Identification

When entering patient data, always ensure that the patient's name and ID number are correct. Make sure that all saved data and hard copy prints contain the patient ID correctly. Identity errors could lead to incorrect diagnosis.

Patient Data

Make sure that the ultrasound diagnostic system is not used to store the patient data and images for the long term. The user is responsible for the data on the system and is strongly recommended to perform a regular backup.

It is advisable to back up the system data to the hard drive prior to any service repairs. It is always possible to lose the patient data during the system failure and repair. Alpinion Medical Systems is not responsible for any lost patient data.

Diagnostic Information

The images and calculations provided by the diagnostic ultrasound system are intended for experienced users and should not be considered as the sole and incontrovertible basis for clinical diagnosis.

Users are encouraged to study the literatures and make their own professional conclusions regarding the clinical utility of the system.

The user should be familiar with product specifications, system accuracy and stability limitations, and consider these limitations before making decisions based on quantitive values.

Equipment malfunction or incorrect settings can result in measurement errors or failure to detect details within the image. The user must become thoroughly familiar with the equipment operation in order to optimize its performance and recognize possible malfunctions.

CAUTION

The system provides calculations (eg, estimated fetal weight) and charts based on published scientific literature. It is the user's responsibility to select the appropriate chart and clinical interpretation of the chart and calculations. The user should consider contraindications when using calculations and charts in scientific literature. In addition, the diagnosis, decision for further examination, and medical treatment must be performed by a qualified physician in accordance with Good Clinical Practice guidelines.

CAUTION

Be certain to ensure the patients' privacy data and confidentiality.

Mechanical Hazards

The use of damaged transducers or improper use and manipulation of the endocavity transducers may result in injury or increase the risk of infection. Inspect transducer often for sharp, pointed, or rough surface damage that could cause injury or tear protective barriers.

Never use excessive force when manipulating endocavity transducers.

CAUTION

Look for any damage that would allow liquid to enter the transducer. If any damage is found, do not use the transducer until it has been inspected and repaired/replaced by ALPINION Service Representative.

CAUTION

Ultrasound transducers are sensitive instruments which can easily be damaged by rough handling. Take extreme care when handling or storing transducers. A damaged housing, lens or cable can result in patient injury or transducer malfunctions.

CAUTION

Do not use the system with defibrillator. The system does not include a defibrillation-proof applied part for ECG.

ALARA (As Low As Reasonably Achievable)

Ultrasound can have harmful effects on tissues, potentially causing patient injuries. Always minimize exposure time and keep ultrasound levels low when there is no medical benefit. Follow the principle of ALARA (As Low As Reasonably Achievable), increasing acoustic output only when needed to achieve a diagnostic quality image. Observe the acoustic output display and make sure you are familiar with all controls affecting the output level.

Training

It is recommended that all users receive proper training in applications before performing them in a clinical setting. ALPINION provides training assistance, if needed. Please contact the local Alpinion representative for training assistance.

Equipment and Personnel Safety

The concerns listed below can seriously affect the safety of equipment and personnel during a diagnostic ultrasound examination.

Do not use the equipment if a safety problem is known to exist. Have the unit repaired and performance verified by qualified service engineer before returning to use.

WARNING

The system voltage may cause serious injury or damage to the system.

- Installing the system yourself may cause damage to the system or electrical shock.
  To avoid damage to the system and avoid electrical shock, only qualified ALPINION service engineer must install the system.
- When you observe that the system causes any malfunction, you must stop operating the system and take proper action for patients. After that, contact ALPINION service engineer.
- Do not modify this system such as system components, or software. When you modify the system, it may cause safety hazards. Only qualified ALPINION service engineer must modify the system.
- Always make sure you turn off the system power and unplug the power cord from the power outlet before cleaning up and disinfecting the system.

WARNING

For patient safety, you must locate the system to easily unplug the power cord from the power outlet when a malfunction or an error occurs.

WARNING

Always use peripherals and accessories approved by ALPINION. You must securely connect peripherals and accessories to the system.

WARNING

The ultrasound diagnostic system is not intended to be used as a data storage device. The user is responsible for the data on the system and is strongly recommended to perform a regular backup.

WARNING

To avoid injury:

- Do not remove the covers of a system yourself to avoid damage to the system and unexpected electrical shock. Only qualified ALPINION service engineer must repair or replace components.
- You must make sure grounded integrity of the power outlet and system regularly.
- To avoid risk of electric shock, you must connect the system to the supply mains with the protective earth.
- Do not allow water or liquids on or above the system. Dripping water or liquids into the system may cause electrical shock and damage to the system.

WARNING

Always make sure that you do not operate the system in the presence of flammable or explosive liquids, vapors or gases. Malfunctions in the system, or sparks generated by fan motors, can electrically ignite these substances. Operators should be aware of the following points to prevent such explosion hazards.

- If flammable substances are detected in the environment, do not plug in or turn on the system.
- If flammable substances are detected after the system has been turned on, do not attempt to turn off the system, or to unplug it.
- If flammable substances are detected, evacuate and ventilate the area before turning off the system.

CAUTION

Do not use this system if a safety problem is known to exist. Have the unit repaired and performance verified by qualified service personnel before returning to use.

CAUTION

- Your ultrasound system is not intended for diagnosing and monitoring ECG.
- Do not use the system for cardiac operation.

CAUTION

Always use approved ECG cables and recommended electrodes by ALPINION.

CAUTION

Always use transducers approved or recommended by ALPINION.

CAUTION

Do not touch the patient and any of the connectors on the system simultaneously, including transducer connectors.

CAUTION

Do not load non-system software on the system computer.

Caution for Moving the System

Before moving the system, check that the brakes on the wheels are unlocked. Also, make sure to retract the monitor arm completely so that it is secured in a stationary position.

Be careful when moving the system. Failure to follow these precautions can result in serious injury and/or system damage.

CAUTION

To avoid serious injury and/or system damage when transporting from one area of use to another:

- Two or more people are required when moving the system on inclines or long distance.
- Secure the monitor and accessories for transport.
- Be sure the pathway is clear.
- Always use the handle at the rear of the console.
- Move the system slowly and carefully.
- Avoid collisions with walls or door frames.
- Always place the system on horizontal ground and engage the wheel brakes.
- Do not move the system when the brakes are engaged.

Caution for Using Monitor

When adjusting the height or position of the monitor, do not place a finger, hand or object on the joint of the monitor or monitor arm to avoid injury or system damage.

CAUTION

- When moving the system, be sure to lock the monitor arm.
- When rotating the monitor, be sure to release the lock. Rotating a locked monitor may cause damage to the internal cable of the system.

Caution for Using Control Panel

When adjusting the height or position of the control panel, make sure nothing is within the range of motion to avoid injury or system damage.

CAUTION

- Do not push the control panel with excessive force.
- Do not lean against the control panel.
- Do not sit on the control panel.
- Do not apply too much pressure to the control panel.
- Do not lift the system using the handles on the control panel.

Caution for Using Touch Screen

When adjusting the tilt angle of the touch screen, pay attention to the back space of the touch screen. Do not place a finger, hand or object within the range of motion to avoid injury or system damage.

CAUTION

Do not push the touch screen with excessive force.

Anti-Virus Program

Since the X-CUBE 70 ultrasound systems are integrated into your IT-network, ALPINION MEDICAL SYSTEMS Co., LTD wants to make sure that you are aware of the proactive measures we are taking to secure the system. Below are measures we have implemented to secure the X-CUBE 70 ultrasound systems.

- Use of Windows* Embedded Standard 10, a componentized version of Windows 10 specifically made for embedded systems. Only the components required are used for the X-CUBE 70 scanners, thereby reducing the OS attack surface. Please note that Windows Embedded Standard 7 is NOT the same operating system as Windows 10.
- Disable the user's ability to access the internet and Windows desktop.
- Disable, or make inaccessible, functionality that is typically used as malware vectors for spreading viruses (e.g. email services, web browsers).
- Disable the AutoRun functionality on removable media.

ALPINION MEDICAL SYSTEMS Co., LTD believes that this Defense in Depth strategy using the combination of the security measures above and the security standards of Microsoft's Windows Embedded Standard 10 will provide security against malware, especially for a system used in a professional, hospital grade networking environment that itself should provide a high level of security measures.

Finally, a few points as to why ALPINION MEDICAL SYSTEMS Co., LTD do not use the anti-virus software. Commercial anti-virus software is commonly used on general-purpose computers to detect the presence of malicious software (e.g. virus, Trojan horse, worm). Anti-virus software is useful on general-purpose computers as they typically cannot be sufficiently hardened against the attack vectors used by malicious software.

The X-CUBE 70 ultrasound systems however are single purpose devices that have controlled intended use, and thus are well hardened. For the X-CUBE 70 ultrasound systems, the potential patient safety and security risks introduced by using commercial anti-virus software would outweigh the security benefits. Such risks include:

- Real-time anti-virus scanning can affect ultrasound system performance.
- The effectiveness of anti-virus software depends on regular updates of the virus definitions files. This would typically require internet connectivity for the ultrasound system.
- The anti-virus software itself is a popular attack vector.
- Disruptive nature of the support of the anti-virus software throughout the life cycle of the medical device. The operating system of a medical ultrasound system is part of a medical device that requires a special and controlled release process. Any update of the anti-virus software would require a change of the system software.

Due to the cited risks, the use of commercial anti-virus software is not part of the X-CUBE 70 ultrasound systems product security strategy.

Cybersecurity

Threats to cybersecurity are getting stronger. Threats from computer viruses and malicious software such as worms, Trojans, Ddos attacks, and other malware are increasing. Multiple levels of vigilance and defense are required to prevent damage to systems, personal information, and various data from such malicious software. This section describes how X-CUBE 70 ultrasound system manage user-level risk for cybersecurity.

User Account

- User account management includes account creation, maintenance, and account suspension and deletion. It is recommended to use the ultrasound system through an individual user account.
- User accounts are created, maintained, and deleted by users with administrator privileges. When received from the factory, the system has 1 user account with administrator privileges.
  (Check the [Admin] account in System Preset > Administrator > Users)
- When you receive your ultrasound system, we recommend that you perform the following steps to manage your system's user account.
  - Register the password for the "Admin" account.
  - Create a user account and register a password.
  - Disable Auto Login function of "Admin" account.

NOTE

For details, see "Administration" on page 5-52.

- The user's password can be changed directly by the user at login or while logged in, or by the system administrator through settings.
- When automatic login is enabled, you can use the ultrasound system without entering a user ID and password.
- For privacy and security reasons, we do not recommend using this feature on your ultrasound system. This feature is included on par with previous versions of the product.

Windows Defender

- Windows Defender is integrated into the ultrasound system as part of the system's layered defenses. Windows Defender monitors your system for known malicious software signatures and behavioral patterns, and updates them periodically through OS Update Patches to improve their detection.
- Operating System level security patches, including Windows Defender, are made through authorized service access by authorized engineers.

Removable Media

- For administrator accounts and general users, direct access to the system is restricted as follows to protect the ultrasound system.
  - Restrict access to system storage and file system
  - Limit remote desktop connection
  - Restrictions on changing network settings and firewall settings
  - Restrictions on settings related to other system configurations
- Only engineers authorized by ALPINION MEDICAL SYSTEMS may use the field service key to gain special access to the ultrasound system. Through this service access, engineers can perform service tasks by accessing system areas that administrators and general users cannot access.
- Data stored on removable media such as USB storage devices, CDs and DVDs is stored unencrypted.
- Data may include personal information and personal medical and health information. As a result, these storage devices and the data on them must be physically protected and processed in accordance with the regulations and guidelines for the processing of personal data.We recommend storing data anonymously, unless it conflicts with the purpose of storing data on removable media.
- Data anonymization reduces the risk of personal information being disclosed in case of loss or neglect of removable media.
- The ultrasound system supports USB-attached storage devices. USB storage devices are used for:
  - Export / Import of patient data and images
  - Backup of patient data
  - Backup / Restore of user settings
- The media autoplay function (AutoPlay) is disabled to prevent automatic execution of the software inside the removable media connected to the ultrasound system.

Security Support

In the event of a cybersecurity breach, immediately discontinue use of the ultrasound system. Disconnect from the network and remove any attached removable media. After that, turn off the power and request technical support through the security manager.

Electrical Safety

The X-CUBE 70 ultrasound system is categorized as a Class I device.

Prevention of Electrical Shocks

WARNING
Do not modify the AC power connector plug of the system to prevent electrical shock.

WARNING
Do not remove the panels or covers of a system to prevent system damage and electrical shock.

WARNING
Do not replace the fuse or power cord by yourself. An ALPINION MEDICAL service engineer or an authorized agent must perform the replacement. Replacing the fuse or power cord by yourself will avoid your warranty.

WARNING
Do not clean or disinfect a system before turning off and unplug the system from the power outlet. Otherwise, it could result in electrical shock and damage to the system.

WARNING
Do not place water or liquids on the system. Dripping water or liquids into the system may cause electrical shock and damage to the system.

WARNING
Using an extension cord setup to provide power to the imaging system, or to the system's peripheral devices may compromise the system grounding and cause your system to exceed leakage current limits.

WARNING
The system voltage may cause serious injury or damage to the system. When you observe that the system causes any malfunction, you must stop operating the system and take proper action for patients. After that, contact ALPINION service engineer.

WARNING

Different voltage power between your system and other devices may cause electrical shock. According to the IEC requirements (Refer to IEC 60601-1-1 and clause 16 of the 3 Ed. of IEC 60601-1, respectively), you must use the equipotential cable (equipotential bonding) to connect additional devices to your system. Contact your ALPINION MEDICAL service engineer.

CAUTION

Do not use aerosol spray cleaners on the monitor to prevent electrical shock and damage to the system.

CAUTION

Using spray cleaners on the system drips cleaning fluid into the system. It damages components in the system.

Transducer Safety

The following recommendations help to prevent preventable transducer damage and serious injuries.

Handling and Care Precautions

Care precautions

CAUTION

Failure to follow the precautions listed below can result in transducer damage and/or electric shock due to damaged electrical insulation.

- Do not apply excessive bending or pulling force to the transducer cable.
- Do not kink, tightly coil, or apply excessive force on the transducer cable.

Handling precautions

WARNING

Do not use damaged or defective transducers. Injury to the operator or patient may occur if cracks, cuts, sharp edges or exposed wiring exist. Cleaning and/ or gel solutions may leak into the transducer resulting in electrical shock. Discontinue use, immediately disconnect the ultrasound transducer and notify the ALPINION Service Representative.

Failure to follow these precautions can result in serious injury.

CAUTION

After each use, inspect the transducer's lens, cable, and casing. Look for any damage that would allow liquid to enter the transducer. If any damage is found, do not use the transducer until it has been inspected and repaired/replaced by ALPINION Service Representative.

Electrical shock hazard

WARNING

Do not drop the transducers. If a transducer has dropped on the floor or on any other hard surface, immediately disconnect the transducer from the ultrasound system. Do not use the transducer any more. There is a risk of electric shock due to damaged electrical insulation.

WARNING

Prior to each use, visually inspect the transducer lens and case area for cracks, cuts, tears, and other signs of physical damage. Do not use a transducer which appears to be damaged until you verify functional and safe performance.

WARNING

Do not immerse the transducer into any liquid beyond the immersion level. Never immerse the transducer connector into any liquid.

WARNING

Do not kink, tightly coil, or apply excessive force on the transducer cable. There is a risk of electric shock due to damaged electrical insulation.

WARNING

Before inserting the connector into the transducer port, inspect the transducer connector pins. If a pin is bent, do not use the transducer until it has been inspected and repaired/replaced by a ALPINION Service Representative.

Special Handling Instructions

WARNING

Protective barriers may be required to minimize disease transmission. Transducer sheaths are available for use with all clinical situations where infection is a concern.

WARNING

Do not use an expired transducer sheath. Before using transducer sheaths, verify whether the term of validity has expired. Failure to follow these instructions could lead to exposure to infectious agents.

WARNING

Devices containing latex may cause severe allergic reactions in latex sensitive individuals.

CAUTION

Do not use pre-lubricated condoms as a sheath. In some cases, they may damage the transducer.

CAUTION

Only use approved coupling gels and cleaning/disinfection agents. Failure to follow the precaution can result in transducer damage.

CAUTION

Adequate cleaning and disinfection is necessary to prevent disease transmission.

- The user is responsible to ensure adequate cleaning and disinfection of ultrasound transducers. Transducers are not sterile when delivered.
- High-level disinfection is recommended for surface transducers and is required for endocavity transducers.
- Transducers must be cleaned and disinfected before they are replaced or disposed.

Biopsy Safety

Precautions Concerning the Use of Biopsy Procedure

WARNING

Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error. Biopsy guidezones are intended to assist the user in determining optimal transducer placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.

WARNING

Biopsy procedures should not be used for In vitro fertilization (IVF), Chronic villus sampling (CVS), and Percutaneous umbilical blood sampling (PUBS).

CAUTION

The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury.

CAUTION

The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.

- Follow the transducer cleaning and disinfection procedures and precautions to properly prepare the transducer.
- Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
- Use protective barriers such as gloves and transducer sheaths.
- After use, follow proper procedures for decontamination, cleaning, and waste disposal.

Failure to follow these instructions could lead to exposure to infectious agents.

CAUTION

Improper cleaning methods and the use of certain cleaning and disinfecting agents may cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. For details, "Transducer Safety" on page 2-13.

CAUTION

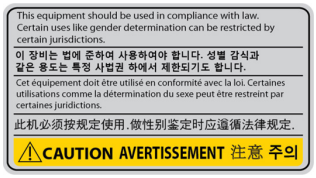
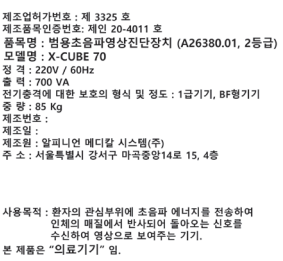
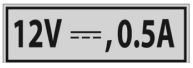
A biopsy must only be performed by physicians with adequate experiences under all circumstances the necessary safety precautions and sterility measures have to be respected.

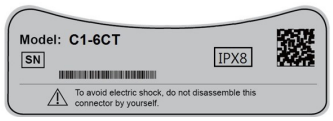
System Symbols and Labels

The following is a list of system symbols and labels for safety. They indicate that you must refer to the manual for specific information to avoid personal injury or damage to the product.

Safety Symbols/ Labels	Location	Explanation
	On the power button of the control panel	System on/off/stand-by
	On the system rating label for overseas, transducer label, and ECG port	Patient applied part meets the isolation requirements for type BF equipment
	On the ECG port	ECG triggered display
	On the transducer label	This symbol indicates that the transducer meets immersion requirements. Depending on the transducer model, the immersion label may differ. Immersion-proof device: Protected against the effects of non-continuous immersion in water
	On the transducer label	This symbol indicates that the transducer meets immersion requirements. Submersion-proof device: Protected against the effects of continuous immersion in water
	On the multi-caution label, rating label for overseas, transducer label, and gel warmer label	This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.
	On rating label for overseas, and system packing box	This system complies with regulatory requirements of Medical Device Regulation 2017/745 regarding medical device.
	On the multi-caution label, gel warmer label, and I/O panel	Consult instructions for use (or consult operating instructions)
	Various locations on labels	Attention (Caution) – consult accompanying documents if complete information cannot be provided on the label
	On the rating label for overseas: Adjacent to the AC power and the AC power outlet	Alternating current in accordance with IEC 60878-01-14

Safety Symbols/ Labels	Location	Explanation
	Adjacent to the AC power outlet	Push-push button
	Adjacent to the AC power	Equipotentiality
	On the right side of the touch screen	Universal Serial Bus
	On the multi-caution label	This symbol indicates that the transducer should not be used in the MRI scanner room.
	On the system rating label for overseas and transducer label	Date of manufacture See ISO 8601 for date format
	On the system rating label for overseas and transducer label	Symbol for manufacturer This symbol shall be accompanied by the name and the address of the manufacturer.
	On the system rating label for overseas and transducer label	Serial Number
	On the multi-caution label	To ensure safety of user, moving and delivering system shall be performed by at least 2 persons.
	On the LCD caution label and multi-caution label	Do not forcibly push the monitor or the system when the casters are locked.
	On the LCD caution label	Do not press or place loads on the monitor when folded. Otherwise, monitor and (or) professional arm could be damaged.
	On the multi-caution label	Do not use mobile transmitter such as mobile phone, radio receiver, broadband power line, etc.
	On the LCD caution label	Be very careful not to injure yourself or damage the system when rotating the monitor arm.
	Rear of the LCD monitor	Caution label

Safety Symbols/ Labels	Location	Explanation
	Top of the monitor arm	Care against pinch shall be taken. (In accordance with IEC 60878)
	Rear of the system body	Multi-caution label
	Right cover of the system body	No gender detection label
	Top (or side panel) of the system body	Safety working load label
	Bottom of the control panel	System rating label for overseas
	Bottom of the control panel	System rating label for domestics
	On the cable port of the gel warmer	Gel warmer voltage label
	Rear of the gel warmer	Gel warmer label
	Transducer	Name of transducer manufacturer, WEEE symbol, indicating separate collection, Certification mark

Safety Symbols/ Labels	Location	Explanation
	Transducer	Transducer name, Serial, IPX Rating, Caution mark

Electromagnetic Compatibility (EMC)

This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emissions limits for a Group 1, Class Medical Device Regulation as stated in EN 60601-1-2.

Electrical medical equipment requires special precautions regarding EMC and must be installed and implemented according to the EMC information provided in the user manual.

AII types of electronic equipment may characteristically cause electromagnetic interference with other equipment, transmitted either through air or connecting cables. The term Electromagnetic Compatibility (EMC) indicates the capability of the equipment to curb electromagnetic influence from other equipment, while at the same time not affecting other equipment with similar electromagnetic radiation.

Radiated or conducted electromagnetic signals can cause distortion, degradation, or artifacts in the ultrasound image which may impair the ultrasound unit's essential performance.

There is no guarantee that interference will not occur in a particular installation. If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- Reorient or relocate the affected device(s).
- Increase the separation between the equipment and the affected device.
- Power the equipment from a source different from that of the affected device.
- Consult the point of purchase or service representative for further suggestions.

Use of accessories, transducers and cables other than those specified may result in increased emission or decreased immunity of the equipment.

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

Devices which intrinsically transmit radio waves, such as cellular phones, radio transceivers, mobile radio transmitters, radio-controlled toys, etc., should preferably not be operated near the equipment. Keep the power to these type devices turned off when near the equipment.

NOTE

Use of devices that transmit radio waves near the equipment could cause it to malfunction. See "Recommended separation distances" on page 2-24 for information about the recommended minimum separation distances between portable and mobile RF communications equipment and the ultrasound unit.

The system or its components should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the system or its components should be observed to verify normal operation in the configuration in which it will be used.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who maybe around this equipment to fully comply with the above requirement.

Electromagnetic Compatibility Tables

Electromagnetic emissions

This system is suitable for use in the following environment. The user must assure that it is used only in the electromagnetic environment as specified.

Guidance and manufacturer's declaration–electromagnetic emissions		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The X-CUBE 70 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The X-CUBE 70 is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes, provided the following warning is heeded: WARNING: The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or reorienting the equipment.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Electromagnetic immunity

This system is suitable for use in the following environment. The user must assure that the system is used according to the specified guidance and only in the electromagnetic environment listed.

Guidance and manufacturer's declaration-electromagnetic immunity

Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment -guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV Contact ±2,4,8,15 kV air	±8 kV Contact ±2,4,8,15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0.5,1 kV line(s) to line(s) ±0.5,1,2 kV line(s) to earth	±0.5,1 kV line(s) to line(s) ±0.5,1,2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 0 % U_T (> 95 % dip in U_T) for 0.5 cycle 0 % U_T (60 % dip in U_T) for 1 cycle 70 % U_T (30 % dip in U_T) for 25 cycle, 30 cycle <0 % U_T (> 95 % dip in U_T) for 250 cycle, 300 cycle	< 0 % U_T (> 95 % dip in U_T) for 0.5 cycle 0 % U_T (60 % dip in U_T) for 1 cycle 70 % U_T (30 % dip in U_T) for 25 cycle, 30 cycle <0 % U_T (> 95 % dip in U_T) for 250 cycle, 300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the X-CUBE 70 image intensifier requires continued operation during power mains interruptions, it is recommended that the X-CUBE 70 image intensifier be powered from an uninterruptible power supply.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE U_T is the a.c. mains voltage prior to application of the test level.

Guidance and manufacturer's declaration-electromagnetic immunity			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment -guidance [c]**
level	Electromagnetic environment - guidance	3 Vrms 3 V/m	Portable mobile RF communications equipment should be used no closer to any part of the X-CUBE 70, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = 1{,}2\sqrt{P}$ $d = 1{,}2\sqrt{P}$ 80 MHz to 800 MHz $d = 2{,}3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol : 

NOTE 1) At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EUT is used exceeds the applicable RF compliance level above, the EUT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the X-CUBE 70.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

[c] See examples of calculated separation distances in next table.

Recommended separation distances

The X-CUBE 70 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the X-CUBE 70 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the X-CUBE 70 as recommended below, according to the maximum output power of the communications equipment.

CAUTION

Portable and mobile RF communications equipment (e.g. peripherals such as antenna cables and external antennas, two-way radio, cellular phones, wireless computer networks) should be used no closer than 30 centimeters (12 inches) to any part of this system including cables provided by or designated by ALPINION MEDICAL SYSTEMS.

Recommended separation distances between portable and mobile RF communications equipment and the ultrasound unit

Rated maximum output power of transmitter [W]	Separation distance according to frequency of transmitter [m]		
	150 kHz to 80 MHz $d = 1{,}2\sqrt{P}$	80 MHz to 800 MHz $d = 1{,}2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2{,}3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where p is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.
NOTE 1) At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Wireless Adapter Specification

- Wireless Standard: IEEE 802.11b/g/n 2.4GHz, IEEE 802.11a/n/ac 5GHz
- Frequency:2.4GHz, 5GHz
- Wireless Security: WEP, WPA/WPA2, WPA-PSK/WPA2-PSK
- Wireless Operation: For details, please refer to "Connectivitiy" on page "Connectivity" on page 5-37.

Immunity and compliance level for system

Immunity test	Frequency of Interest [MHz]	Actual Immunity Level	Compliance Level
Conducted RF IEC 61000-4-6	0.15 MHz to 80 MHz	3 Vrms	0.3 Vrms
Radiated RF IEC 61000-4-3	80 MHz to 800 MHz	3 V/m	1 V/m
	800 MHz to 2.5 GHz	3 V/m	3 V/m

Diagnostic Ultrasound Indications for Use Format

X-CUBE 70 Ultrasound System

Indications for Use (Describe)

The X-CUBE 70 diagnostic ultrasound system is intended for use by, or by the order of, and under the supervision of, a licensed physician who is qualified for the evaluation of soft tissue and blood flow in the clinical applications of Fetal; Abdominal(renal & GYN/pelvic); Pediatric; Small Organ(breast, testes, thyroid); Neonatal Cephalic; Adult Cephalic; Trans-rectal; Trans-vaginal; Musculo-skeletal(Conventional); Musculo-skeletal(Superficial); Cardiac(adult& pediatric);Trans-esoph(Cardiac), Peripheral Vessel(PV); and Urology(including prostate).

And, the imaging modes are 2D(B) mode; Harmonic mode(HAR); M mode; Color M mode; Anatomical M mode; Color Flow Doppler(CF) Mode; Power Doppler(PD) Mode; Directional PD mode; Pulsed Wave Doppler(PWD) Mode; Continuous Wave Doppler(CWD) Mode; High PRF Doppler mode; Tissue Doppler Imaging(TDI) Mode; 3D/4D mode.

The X-CUBE 70 is intended to be used in a hospital or medical clinic.

Clinical Application	**Mode of Operation**								
	B	**M**	**PWD**	**CWD**	**Color Doppler**	**Power Doppler**	**Tissue Harmonic Imaging**	**Combined* (Specify)**	**Other** (Specify)**
Ophthalmic									
Fetal	P	P	P		P	P	P	P	P
Abdominal	P	P	P		P	P	P	P	P
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	P
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic	P	P	P		P	P	P	P	
Trans-rectal	P	P	P		P	P	P	P	P
Trans-vaginal	P	P	P		P	P	P	P	P
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult	P	P	P	P	P	P	P	P	
Cardiac Pediatric	P	P	P	P	P	P	P	P	
Intravascular (Cardiac)									

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P	P	P	P	P	P	
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with L3-8H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with L3-12X Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with L3-15H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SL3-19H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SL3-19X Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	N	N	N		N	N	N	N	
Abdominal	N	N	N		N	N	N	N	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	N	N	N		N	N	N	N	
Small Organ (breast, testes, thyroid)	N	N	N		N	N	N	N	
Neonatal Cephalic	N	N	N		N	N	N	N	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	N	N	N		N	N	N	N	
Musculo-skeletal (Superficial)	N	N	N		N	N	N	N	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with L10-25H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SC1-7H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SC2-9H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SC2-11H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	N	N	N		N	N	N	N	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	N	N	N		N	N	N	N	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric	N	N	N		N	N	N	N	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with MP1-5X Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic	P	P	P		P	P	P	P	
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult	P	P	P	P	P	P	P	P	
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SP3-8T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric	P	P	P	P	P	P	P	P	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with SVC1-8H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	P
Abdominal	P	P	P		P	P	P	P	P
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	P
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with CW2.0 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult				P					
Cardiac Pediatric				P					
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with CW5.0 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult				P					
Cardiac Pediatric				P					
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with CW8.0 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult				P					
Cardiac Pediatric				P					
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with EV2-11H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	
Trans-vaginal	P	P	P		P	P	P	P	
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with EC2-11H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	
Trans-vaginal	P	P	P		P	P	P	P	
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

X-CUBE 70 with VE3-10H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	P
Trans-vaginal	P	P	P		P	P	P	P	P
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K211299; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

Acoustic Output

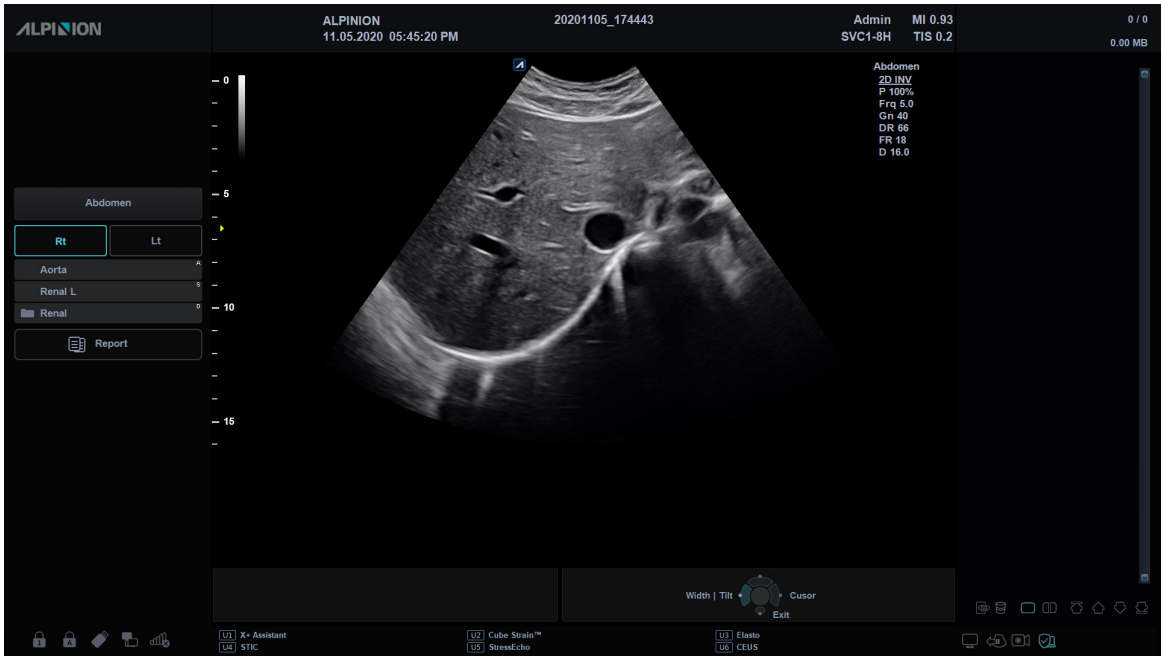
The X-CUBE 70 ultrasound system shows the acoustic output display (e.g. Mechanical Index (MI), Thermal Index (TI)) on the upper right side of the screen. This acoustic output display allows you to monitor the acoustic levels generated by the system. For more information on Acoustic Output, See "**2. Acoustic Output**" in the X-CUBE 70 Reference Manual.

Two standards for the acoustic output display are as follows:

- AIUM/NEMA UD3 Standards for Real-time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound equipment.
- IEC 60601-2-37, Mechanical Electrical Equipment – Part 2-37: Particular Requirements for the Safety of Ultrasound Medical Diagnostic and Monitoring Equipment.

WARNING

You should use the X-CUBE 70 ultrasound system at the lowest mechanical/thermal index setting necessary to generate clinically acceptable images.



Acoustic Output Display (Mechanical/Thermal indices)

The X-CUBE 70 ultrasound system displays Mechanical index (MI) and Thermal index (TI) on the upper right side of the screen.

The acoustic output display has three values as follows:

- Mechanical Index (MI)
- Thermal Index (TI)
- Power value

MI is used as an indicator of the mechanical bio-effect such as cavitation in the tissue. TI represents the ratio of total power to the power required to raise tissue by 1°C. The power value informs you of where the system is operating within the range of available output power.

One of the following TI values display on the screen based on the application and type of tissue.

- Soft Tissue Thermal Index (TIS)
- Bone Thermal Index (TIB)
- Cranial Bone Thermal Index (TIC)

The TI and MI are displayed all the times. The MI and TI display start at a value of 0.4 and increments in steps of 0.1 (values less than 0.4 are displayed as < 0.4).

Controls Affecting Acoustic Output

The potential for producing mechanical bioeffects (MI) or thermal bioeffects (TI) can be influenced by certain controls. The power control has the most significant effect on Acoustic Output. Indirect effects may occur when adjusting controls.

Controls that can influence MI and TI are detailed under the bioeffects portion of each control in the "**6. Imaging Modes**". Always observe the acoustic output display for possible effects.

WARNING

Be sure to have read and understood control explanations for each mode used before attempting to adjust the power control or any control that can affect Acoustic Output.

To minimize exposure time and keep ultrasound levels low, operate your system by using the ALARA (As Low As Reasonably Achievable) principle, increasing output only when you needed to obtain diagnostic image quality. It is recommended that all users receive ALARA training program. The ALARA training program by ALPINION application specialists provides you with basic ultrasound principles, possible biological effects, the derivation and meaning of the indices, ALARA principles, and examples of specific applications of the ALARA principle.

Principle of ALARA

The principle of ALARA, which stands for As Low As Reasonably Achievable, is to keep the radiation exposure at the minimum level necessary to obtain the diagnostic information. This principle is widely practiced in medical x-ray protection where exposure at any level is potentially harmful. Historically, ALARA was initiated as a cautious approach for dealing with uncertain hazards but has since become the principle method for reducing the risk of injury from hazards that do not have safe minimum threshold.

While no minimum thresholds for harmful bioeffects have been established with the use of diagnostic ultrasound, the principle of ALARA can be readily implemented on equipment incorporating an output display. As the operator adjusts the equipment to optimize the image quality, the display interactively updates to indicate the effect on output.

Controls that have no noticeable impact on image quality should be set to minimize the output while controls that improve the image quality and also increase acoustic output should be set no higher than needed to achieve a diagnostic quality image.

3

System Overview

This chapter describes the system overview and operator controls.

Introduction

System Specifications

The X-CUBE 70 ultrasound system provides excellent quality and reliability as well as these specific features:

Table 3-1 System specifications

Physical Dimensions	• Height: 1440/1605 mm • Width: 580 mm • Depth: 835 mm • Weight: 85 kg (not including options)
Applications	• Abdomen • Obstetrics(OB) • Gynecology(GYN) • Cardiology • Small Parts • Musculoskeletal(MSK) • Vascular • Urology • Emergency Medicine(EM) • TCD • Breast • Appendix
Available Imaging Modes	• 2D mode • Harmonic mode (HAR) • M mode • Color M mode • Anatomical M mode (AMM) • Color Flow Doppler (CF) mode • Power Doppler (PD) mode • Directional PD mode • Pulsed Wave Doppler (PWD) mode • Continuous Wave Doppler (CWD) mode • High PRF Doppler mode • Tissue Doppler Imaging (TDI) mode • 3D/4D mode
Image Processing Technology	• Xpeed™ • Full SRI™ • Spatial Compounding Image (SCI) • Panoramic • Live HQ™ • Needle Vision™ Plus • Contrast Enhanced Ultrasound (CEUS) • ECG • Elastography • X^+ Point Shear Wave • X^+ MicroView

Image Processing Technology (cont.)	• Filter Method Tissue Harmonic Image (FTHI) • Pulse Inversion Tissue Harmonic Image (PTHI) • Raw Data Processing • Post Processing	
Operable Transducers	Pencil Doppler	• CW2.0 • CW5.0 • CW8.0
	Linear Array	• L3-8H • L3-12X • L3-15H • L10-25H • SL3-19H • SL3-19X
	Sector Phased Array	• MP1-5X • SP3-8T
	Convex Array	• SC1-7H • SC2-9H • SC2-11H
	Endocavity	• EV2-11H • EC2-11H
	Volume Convex	• SVC1-8H
	Volume Endocavity	• VE3-10H
Measurement Package	Including reports for: • Abdomen • Obstetrics(OB) • Gynecology(GYN) • Cardiology • Vascular • Urology • Pediatrics • Small Parts • Breast • Musculoskeletal(MSK) • Emergency Medicine(EM)	
Basic Measurements	2D Mode	• Distance, Ellipse, Trace • Area, Circumference • %Stenosis • Volume • Angle • A/B Ratio • Volume Flow Area
	M Mode	• A/B Ratio • Distance • Time • Slope • %Stenosis • HR

Basic Measurements (cont.)	Doppler Mode	• Velocity • Time • PI • Trace • Acceleration • S/D Ratio • RI • Auto Trace
Connectivity	• Verification • DICOM Storage • DICOM Print • DICOM Storage commitment • DICOM Media • DICOM Worklist • DICOM MPPS • DICOM Q&R • DICOM Structured Report (OB-GYN) • DICOM Structured Report (Echocardiography) • DICOM Structured Report (Vascular) • Cube View™ • Network Storage • Wireless LAN (Option)	
User Interface	• English • German • French • Spanish • Italian • Russian • Portuguese • Chinese	

NOTE

Not all features, transducers, optional supplies or peripherals described in this document may be available or cleared for sale in all markets. Please contact your local agent or local Alpinion sales representative to get the latest information.

Console Overview

This system consists of monitor, control panel, console, peripheral devices and transducers.

Front View

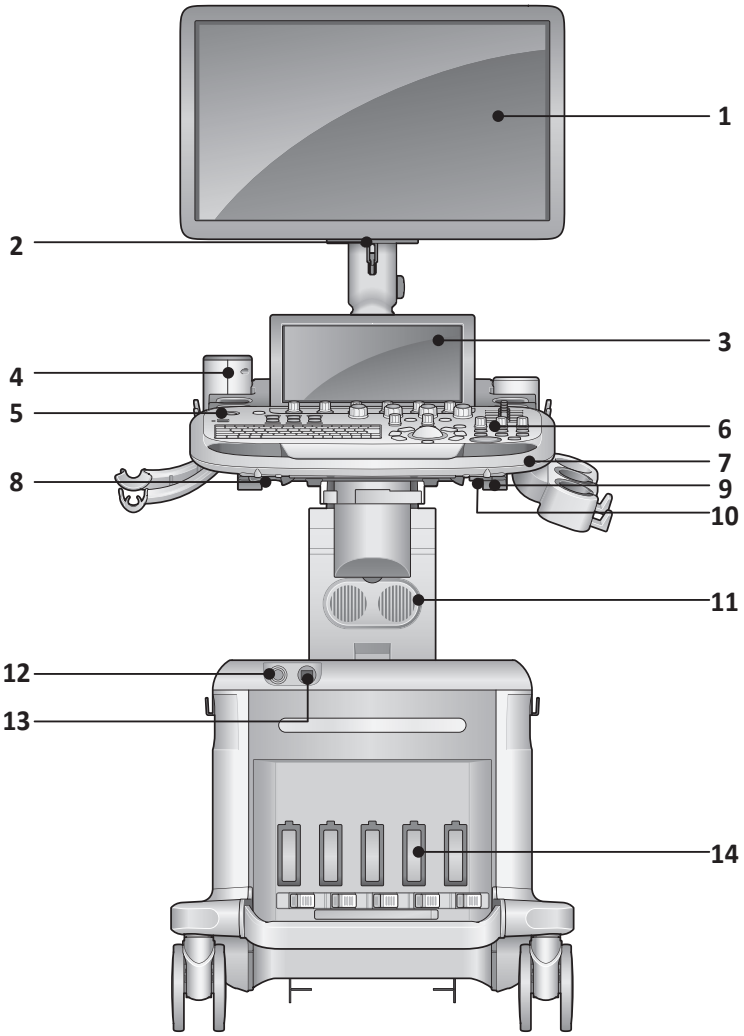


Figure 3-1 Front View

No.	Component	No.	Component
1	Monitor	**8**	Control panel swivel button
2	LED lamp	**9**	Transducer cable hook
3	Touch screen	**10**	Control panel up/down button
4	Gel warmer	**11**	Speaker
5	Transducer holder	**12**	CW port
6	Control panel	**13**	ECG port
7	Front handle	**14**	Transducer port

Rear View

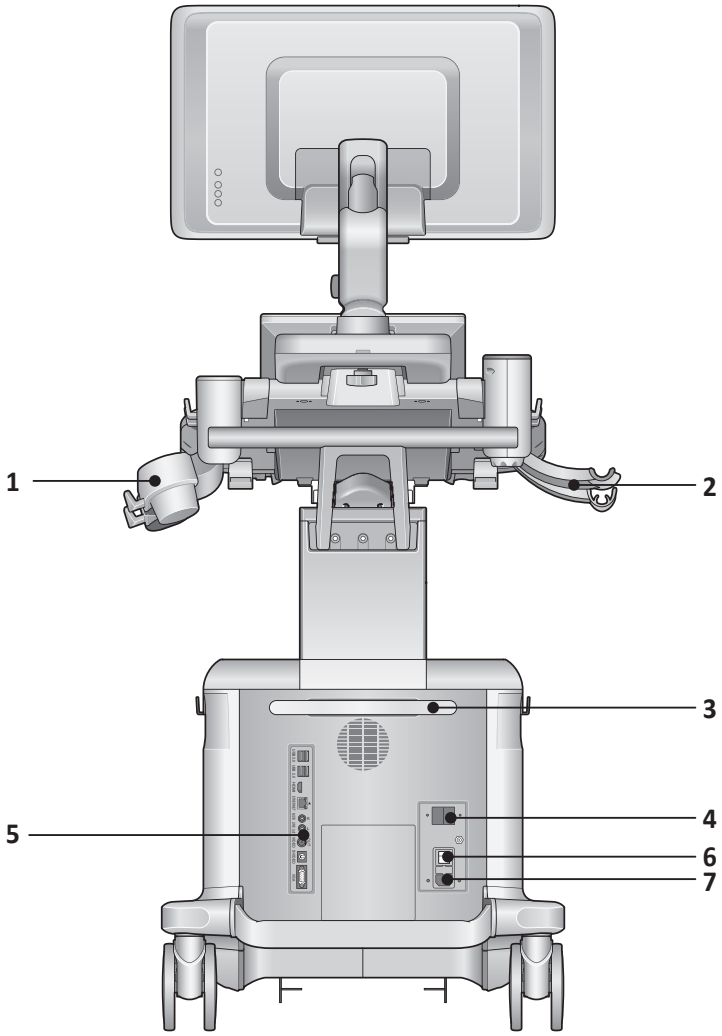


Figure 3-2 Rear View

No.	Component	No.	Component
1	Transducer holder	**5**	I/O panel
2	Endocavity transducer holder	**6**	System On/Off switch
3	Power cord wrap hook	**7**	AC inlet
4	AC outlet		

NOTE

When connecting an external monitor to your system, use the monitor with 1366 x 768 or higher resolution.

Side View

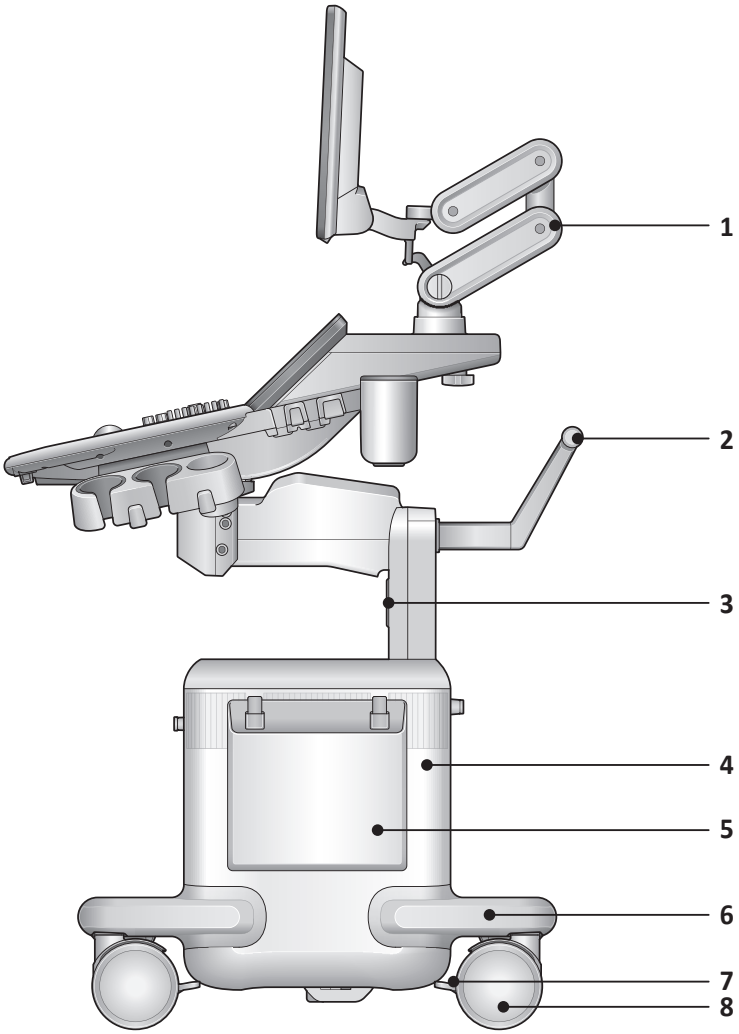


Figure 3-3 Side View

No.	Component	No.	Component
1	Monitor arm	**5**	Side tray
2	Rear handle	**6**	Body base
3	Speakers	**7**	Caster lock
4	Body cover	**8**	Caster

Peripheral area

In the middle of the system, you can place optional peripherals such as black and white printer and color printer.

CAUTION

The peripheral area is only for peripheral devices. Do not place transducers or the footswitch in the peripheral area to prevent damaging them from accidentally falling off.

Monitor and Touch Screen

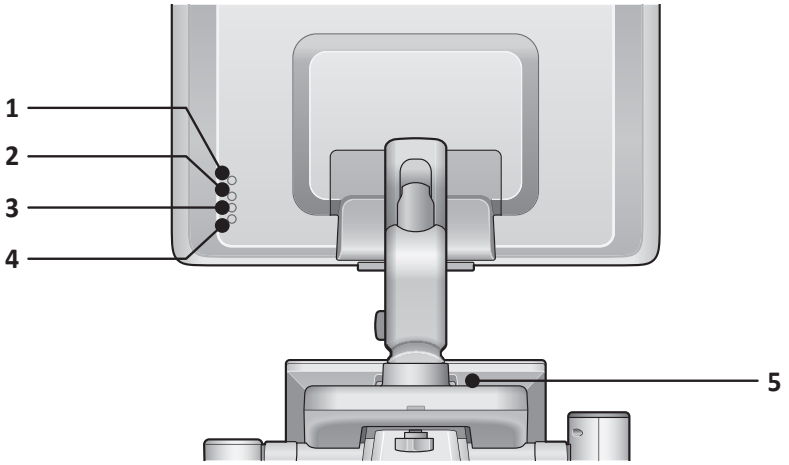


Figure 3-4 Monitor Buttons

No.	Component	No.	Component
1	LED lamp button	**4**	Down (∨) button
2	Up (∧) button	**5**	Touch screen Brightness buttons
3	Mode/Select (◇) button		

CAUTION

The LED lamp may overheat. Be careful not to directly touch it to avoid injury.

I/O Panel

I/O panel located on the rear side of a system includes video input and output, audio input and output, Ethernet, power and control connections for a printer. See Figure 3-5 below for more details.

CAUTION

- Each outer (case) ground line of peripheral/accessory connectors are earth grounded. Signal ground lines are not isolated.
- For compatibility reasons, use only ALPINION approved transducers, peripherals or accessories.
- Be sure to plug the power supply cable of the peripherals to the connector panel of the system to avoid unexpected electrical shock.
- Do not connect any transducer or accessories without approval from ALPINION.

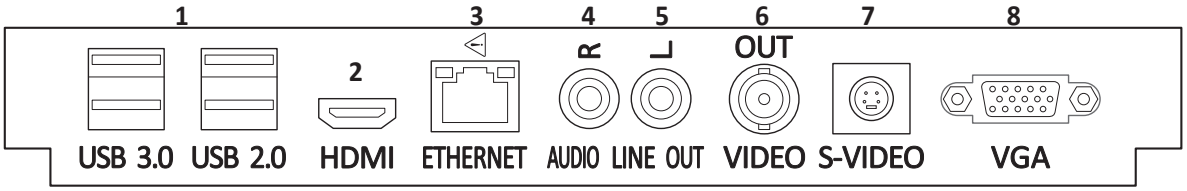


Figure 3-5 I/O Panel

No.	Component	No.	Component
1	USB port (4 ports)	**5**	Audio out port (Left)
2	HDMI port	**6**	Video input port
3	Ethernet port	**7**	S-Video output port
4	Audio out port (Right)	**8**	VGA port

CAUTION

- The connection of equipment or transmission network other than as specified in these instructions can result in electric shock hazard.
- Connected peripherals must meet IEC standard (An equipment that processes data: IEC 60950/EN 60950, a medical equipment: IEC 60601-1/EN 60601-1). For product configuration, it must meet the safety requirements of product standard IEC/EN 60601-1 or system standard IEC 60601-1-1/EN 60601-1-1.
- The operator shall not contact the parts (SIP/SOP) and the patient simultaneously.
- When connecting a cable to the ethernet (LAN) port, always use the optional LAN isolator (EN-20G by EMO system or any similar isolator complying with IEC/EN 60601-1) to protect your system from electrical damage.

NOTE

If power consumption of the external storage media such as USB HDD exceeds 1A, you should use a Y-cable that makes the external storage media receive power from two USB ports at the same time.

NOTE

USB 3.0 devices that are not compatible with Windows 10 OS may not be recognized and operated when connected to the USB 3.0 port on the control panel or at the rear of the system. Connect the device to the USB 2.0 port located at the rear of the system or contact the manufacturer of the USB 3.0 device.

NOTE

You should connect DVD-RW to the X-CUBE 70 via the USB 3.0 port located at the rear of the system or on the control panel.

Footswitch (Option)

The optional tri-pedal footswitch that is connected with the rear panel of your system performs specific functions easily instead of pressing function keys on the control panel.

The each pedal of the footswitch may have different functions depending on the assigned settings such as **Freeze**, **P1**, **P2**, **P3**, **P4** and **Rec/Pause**.

You can configure its functionality via **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.

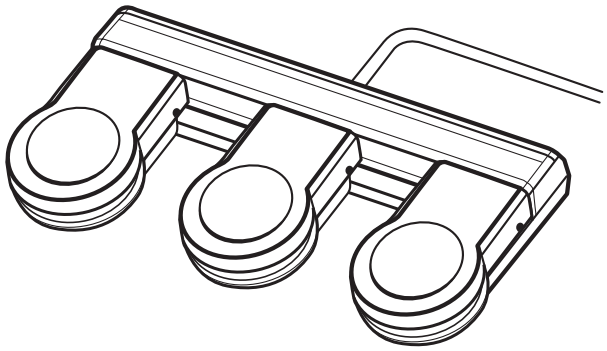


Figure 3-6 Tri-pedal Footswitch

CAUTION

Do not place or store the footswitch in the peripheral area on the system to prevent damaging the footswitch from accidently falling off.

Wireless LAN (Option)

A Wireless Network is available on the X-CUBE 70. When the WLAN is active, the status bar displays an icon appears in the status bar to indicate whether the WLAN is installed or disconnected.

For adjusting a wireless LAN connection, see "Network" on page 5-42.

Using unrecommended wireless LAN adapter may cause system malfunction. To prevent system malfunction, only use wireless LAN adapters approved or recommended by ALPINION.

NOTE

Please contact your local agent to get the latest information on compatible wireless LAN adapters.

Battery (Option)

This system uses lithium ion batteries. The lithium ion battery provides power if AC power is not available or the power cable is unplugged.

The system battery is a purchasable option. If this option is not purchased, the battery icon is not displayed.

CAUTION

The battery is used to ensure quick system startup and easy movement of the system only. You cannot perform scans while in Battery Power mode. For more information on Battery Powr mode, please refer to "Battery Power Mode" on page 4-7.

NOTE

- The battery is designed to work with X-CUBE 70 systems only. Use only the batteries authorized by Alpinion Medical Systems.
- The battery may need to be replaced. Only ALPINION MEDICAL service personnel have access to the embedded battery. Please contact your local service representatives for replacement.

System Options

In addition to the standard features available on your system, other features are available as purchasable options. Available option types include imaging features, advanced quantification software, protocols, and connectivity features.

NOTE

Some options may not be available in certain countries.

Optional Function		
• CV M&R	• Live HQ™	• X+ MicroView
• DICOM 3.0 Connectivity	• Elastography	• X+ pSWE
• DICOM SR (OB)	• Cube View™	• X+ Assistant
• DICOM SR (Adult Echo)	• Needle Vision™ Plus	• X+ Auto Biometry
• DICOM SR (Vascular)	• Auto NT	• X+ Auto Follicle
• DICOM Query	• X+ 3D4D	• X+ Auto IVC
• Auto IMT	• X+ Volume Advance	• TI-RADS
• CW	• Cube Note	• BI-RADS
• Anatomical-M	• AutoEF	
• Panoramic	• STIC	
• Tissue Doppler Image	• CEUS	
• Stress Echo	• Silhouette View	
• Cube Strain™	• STL 3D Printing	

For further information about options, please refer to the relevant chapters in this manual.

Peripheral Devices

Before using the peripherals or accessories, you should consider the following requirements.

WARNING
Observe all warnings and cautions given in the operation manual of peripheral device.

CAUTION
For compatibility reasons, use only ALPINION approved peripherals or accessories. DO NOT connect any peripherals or accessories without approval by ALPINION.

Peripheral Update for EU Countries

The following is intended to provide the users in EU countries with updated information concerning the connection of the X-CUBE 70 to image recording and other devices or communication networks.

The X-CUBE 70 has been verified for overall safety, compatibility and compliance with the following on-board image recording devices:

- Color Printer
  Manufacturer: Sony Corporation
  Model: UP-D25MD, UP-25MD
- B/W Printer
  Manufacturer: Sony Corporation
  Model: UP-D897, UP-897MD, UP-D898MD, UP-X898MD, UP-D25MD, UP-25MD
- DVD-RW
  Manufacturer: Hitachi-LG Data Storage, Inc
  Model: GP65NB60

The X-CUBE 70 has also been verified for compatibility, and compliance for connection to a local area network (LAN) via the rear panel Ethernet connection, provided the LAN components are IEC/EN 60950 compliant.

The X-CUBE 70 may also be used safely while connected to devices other than those recommended above if the devices and their specifications, installation, and interconnection with the system conform to the requirements of IEC/EN 60601-1-1.

Accessories

The following accessories are not included in the CE certification.

Before using the accessories, you should consider the following requirements.

CAUTION

For compatibility reasons, use only ALPINION approved accessories. DO NOT connect any accessories without approval by ALPINION.

Basic Accessories

The X-CUBE 70 has the following basic accessories:

• X-CUBE 70 console	• User Manual, Reference Manual (Soft copy)
• Sonic gel	• Quick Guide (Soft copy)

Optional Supplies and Accessories

The following tables show optional supplies and accessories that have been verified to be compatible with the system.

NOTE

The user manual refers to optional supplies and accessories that can be compatible with the system. It might be possible that some optional supplies or accessories are NOT available in certain countries.

Biopsy Kit
• L3-12 Biopsy Starter Kit (for SL3-19H, L3-8H, L3-15H)
• L3-12X Biopsy Starter Kit (for L3-12X, SL3-19X)
• SC1-6 Biopsy Starter Kit (for SC1-7H)
• EV2-11H Reusable Starter Kit (for EV2-11H, EC2-11H)
• VE3-10H Disposable Starter Kit (for VE3-10H)
• VE3-10H Reusable Starter Kit (for VE3-10H)

Console Accessory
• Tri-pedal footswitch
• ECG Cable
• Side tray
• Endocavity transducer holder

Image Display

The image display consists of an ultrasound image, application information, patient information, and indicators.

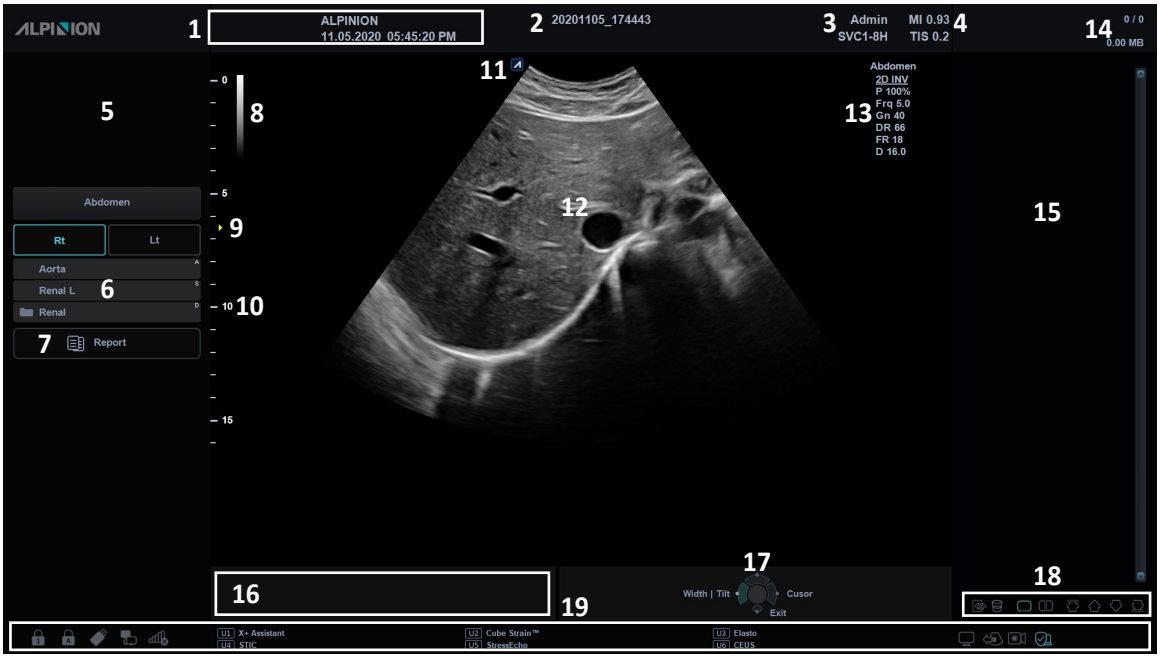


Figure 3-7 Image Display

1	Hospital logo & name	**12**	Image area
	Current date & time	**13**	Image parameter
2	Patient ID, Patient name	**14**	Clipboard indicator
3	Operator ID, Transducer name	**15**	Image clipboard
4	Mechanical index, Thermal index	**16**	System message area
5	Zoom reference window	**17**	Trackball controls and status
6	Labeled measurement menu	**18**	Clipboard icons: Thumbnail Preview, Trash can, Single & Dual layout format, Scroll Up/ Down/Home/End
7	Report		
8	Gray/Color scale bar	**19**	Status bar: Symbol lock, Caps lock, USB connection, Network connection, Wireless network connection, User defined key, Data backup status, Cube View connection, DVR status, Windows Defender, Battery status
9	Focal zone marker		
10	Depth scale marker		
11	Transducer orientation marker		

Screen Saver

Screen saver mode automatically activates to save the system power when you do not operate the system and the system stays in idle for a specified time. To deactivate this mode and return to normal operating mode, press any key on the control panel.

NOTE

To configure the screen saver settings, go to **Utility** > **Setup** > **SystemPreset** > **System** > **General** > **Monitor**.

Control Panel

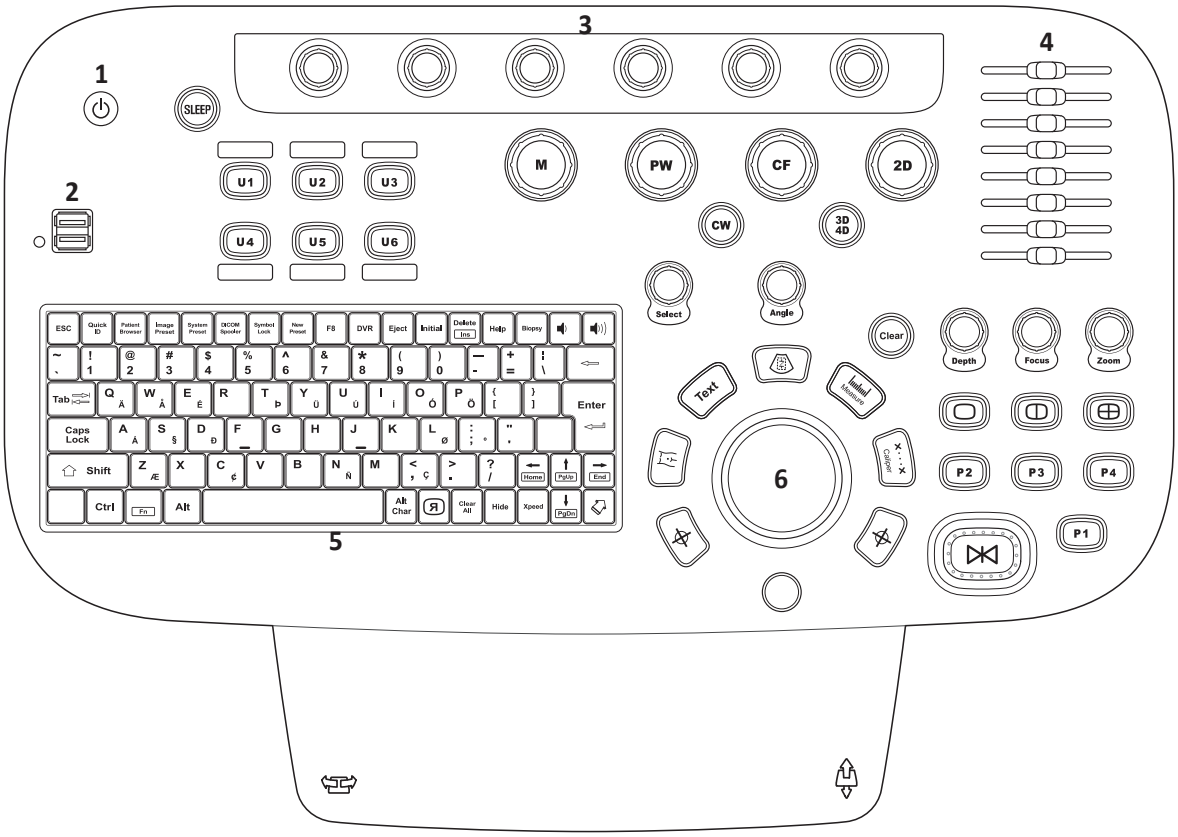
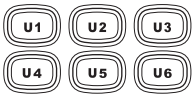
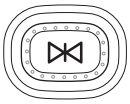


Figure 3-8 Control Panel Layout

1	Power On/Off control	**4**	TCG slide controls
2	USB port	**5**	QWERTY keyboard
3	Soft keys	**6**	Trackball

Table 3-3 Key description

Control	Control Name	Description
	**SLEEP**	Activate Sleep mode.
	**User-Defined Keys (U1–U6)**	Access user-defined functions. The function for each key can be assigned in **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined Key**.
	**M**	Activate M mode.
	**PW**	Activate PW mode.
	**CF**	Activate CF mode.
	**2D**	Activate 2D mode.
	**CW**	Activate Continuous Wave (CW) Doppler mode. This control is optional.
	**3D4D**	Activate 3D or 4D mode.
	**Select**	Select the desired function from the context menu on the screen.
	**Angle**	Adjust the angle. • In 2D or Color mode, rotate to adjust the angle steer. • In CW or PW mode, rotate to adjust the Doppler angle correct. • In Body Pattern mode, rotate to adjust the transducer angle. • In Arrow mode, rotate to adjust the arrow angle. • In CW or PW mode, press to adjust the auto angle.
	**Clear**	Delete the arrow, annotation, body patterns and measurement results displayed on an image.
	**Depth**	Adjust the scanning depth of an image.
	**Focus**	Change location and number of focus on the area of interest.
	**Zoom**	Turn the Zoom mode on. • Rotate to activate Read zoom. • Press to activate Write zoom in Read zoom mode.

Control	Control Name	Description
	**Set/Cur**	**Set** or **Cursor** function may be assigned to these keys. The function for each key can be assigned in **Utility** > **Setup** > **SystemPreset** > **System** > **Control Panel** > **Key** > **Set the Cursor and Set keys**. • **Set**: Select an item or value using the trackball. • **Cursor**: Display the cursor on the screen.
	**Body Pattern**	Activate the annotation function in order to add body patterns to an image.
	**Text**	Activate the annotation function in order to type text on an image.
	**Caliper**	Start basic measurements such as distance, circumference, area, and volume.
	**Measure**	Start measurements by application.
	**Priority**	Adjust the priority of Trackball. • In 2D mode, press to select the priority between the width and tilt functions. • In Duplex or Triplex mode, press to select the priority between ROIs of the activated imaging modes.
	**Single, Dual, Quad**	View an image in dual or quad screen.
	**P1, P2, P3, P4**	Control the designated recording device or perform alternative storage. To configure these keys, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
	**Freeze**	Pause and resume scanning.
	**User-Defined Key (U7)**	You can use this control as an user-defined hard key. The function for the key can be assigned in **Utility** > **SystemPreset** > **Setup** > **User Setting** > **User Defined Key**. **TIPS** • **Exit**: Exit current screen (mode) and return to the previous screen (mode). • **End Exam**: End the current study and store patient and measurement data and clear all temporary data.

QWERTY Keyboard

The QWERTY keyboard is available which you can enter text or perform special functions.

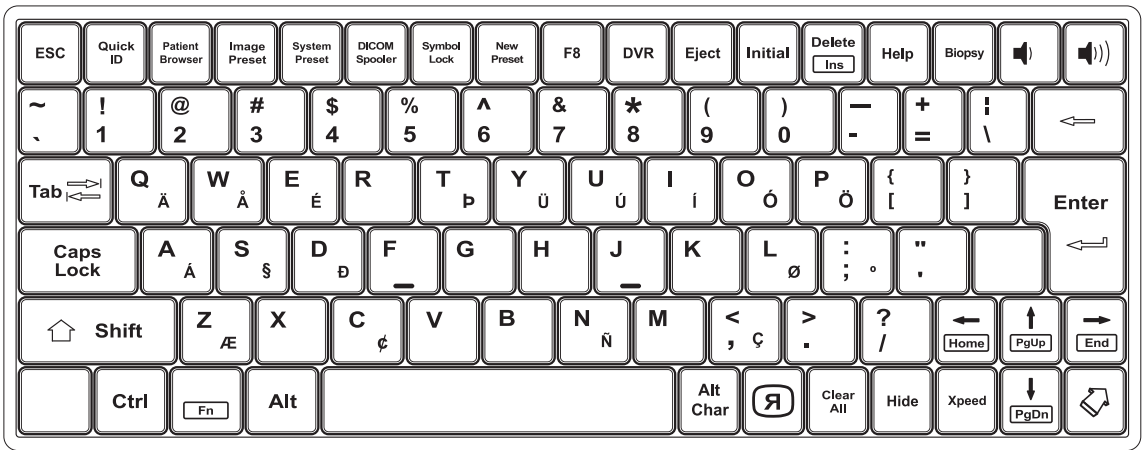


Figure 3-9 Keyboard Layout

Using the Special Keys

Table 3-4 Special key description

Control	Control Name	Description
Quick ID	**Quick ID**	Access the ***Quick ID*** screen.
Patient Browser	**Patient Browser**	Access the ***E-View*** screen.
Image Preset	**Image Preset**	Access the ***Image Preset*** screen.
System Preset	**System Preset**	Access the ***System Preset*** screen.
DICOM Spooler	**DICOM Spooler**	Access the DICOM Spooler.
Symbol Lock	**Symbol Lock**	Lock all keyboard symbol keys.
New Preset	**New Preset**	Create your own user preset.
DVR	**DVR**	Access the **DVR** menu.
Eject	**Eject**	Eject a media.
Initial	**Initial**	Restore the default settings of the current function.
Help	**Help**	Access the electronic manual.

Control	Control Name	Description
	**Biopsy**	Show the biopsy guideline.
	**Speaker Volume**	Turn up/down the speaker volume.
	**Reverse**	Flip the image 180 degrees left/right.
	**Clear All**	Clear your input or cancel your selection.
	**Hide**	Hide the current menu screen.
	**Xpeed**	Activate Xpeed to automatically optimize image parameters on the live screen.
	**Arrow**	Show the arrow pointer on the screen.

Touch Screen

Your ultrasound system has the touch screen that enables you to easily access menus or adjust options on the current monitor display.

The exam function controls are accessed from a Shortcut bar at the top of the touch screen.

The scanning mode controls are organized in tab pages. For each tab, two pages may be accessed by swiping laterally anywhere on the touch screen.

At the bottom of the touch screen, there are six rotary/push buttons. The functionality of these buttons changes based on the active mode/function.

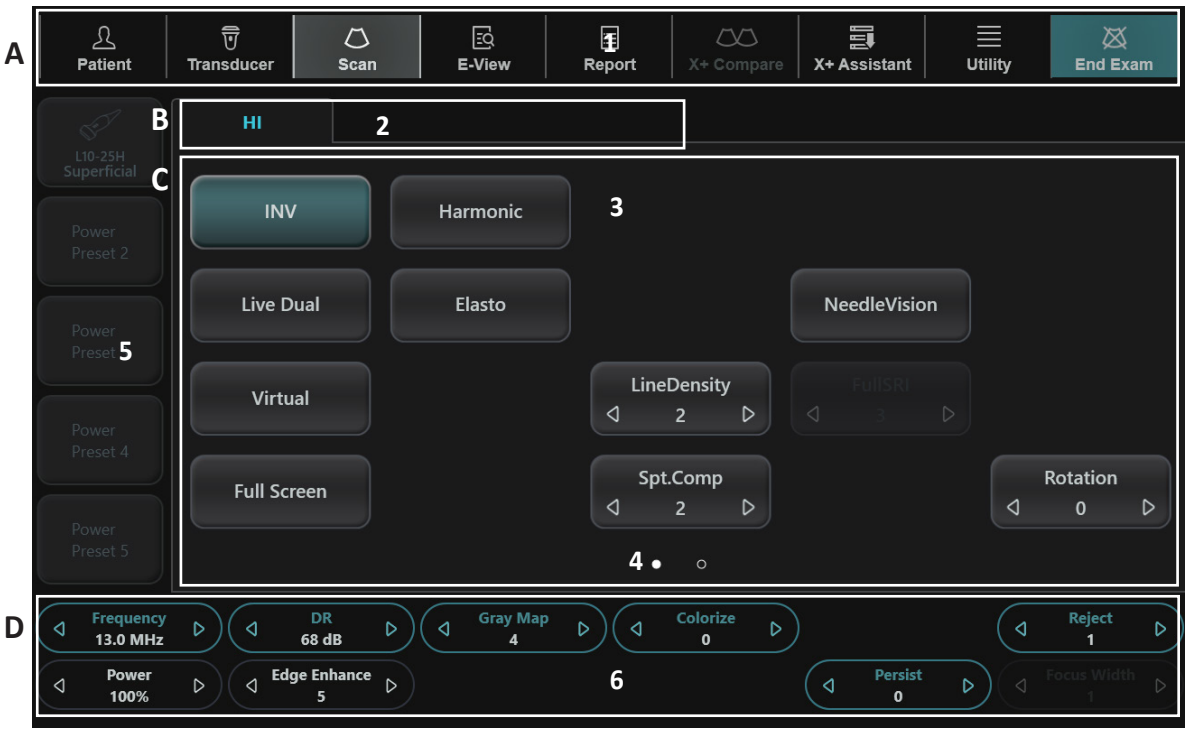


Figure 3-10 Touch Screen

Table 3-5 Touch screen description

No	Control	Description
A	**Workflow Area**	Contain tools that enable the major workflow activities for starting, performing, and completing an exam.
1	**Shortcut Bar**	Quick access to different functions on the system.
B	**Tabs**	Contain mode-specific or application-specific controls in different tabs.
2	**Scanning Modes Tab**	Select the tab to activate scanning mode.
C	**Controls**	The main area of the touch screen, which shows the controls for the currently selected tab in the current mode or application.
3	**Touch Menus**	Touch buttons with mode/function specific controls.
4	**Page Indicator**	Switch to the previous/next page of the touch menu screen. To move to the previous/next page, touch the "dot"or swipe from right to left/left to right.

No	Control	Description
5	**Power Preset 1-5**	Show up to five (5) Preset buttons configured at System Preset.
D	**Soft Key Labels**	Display the labels for the current functions of the soft keys. Some modes and applications have two rows of labels, while some have no soft keys. You can select the functions assigned to the soft keys by touching the labels or by pressing or rotating the knob below the label.
6	**Soft Menus**	Rotary/Push buttons with mode/function specific controls. • Press the button to switch between controls. • Rotate the dial to adjust the value.

Shortcut Bar

The Shortcut bar gives quick access to different functions on the system. The default functions available on the Shortcut bar depend on the examination category selected. Additional functions are available by touching **Utility**.

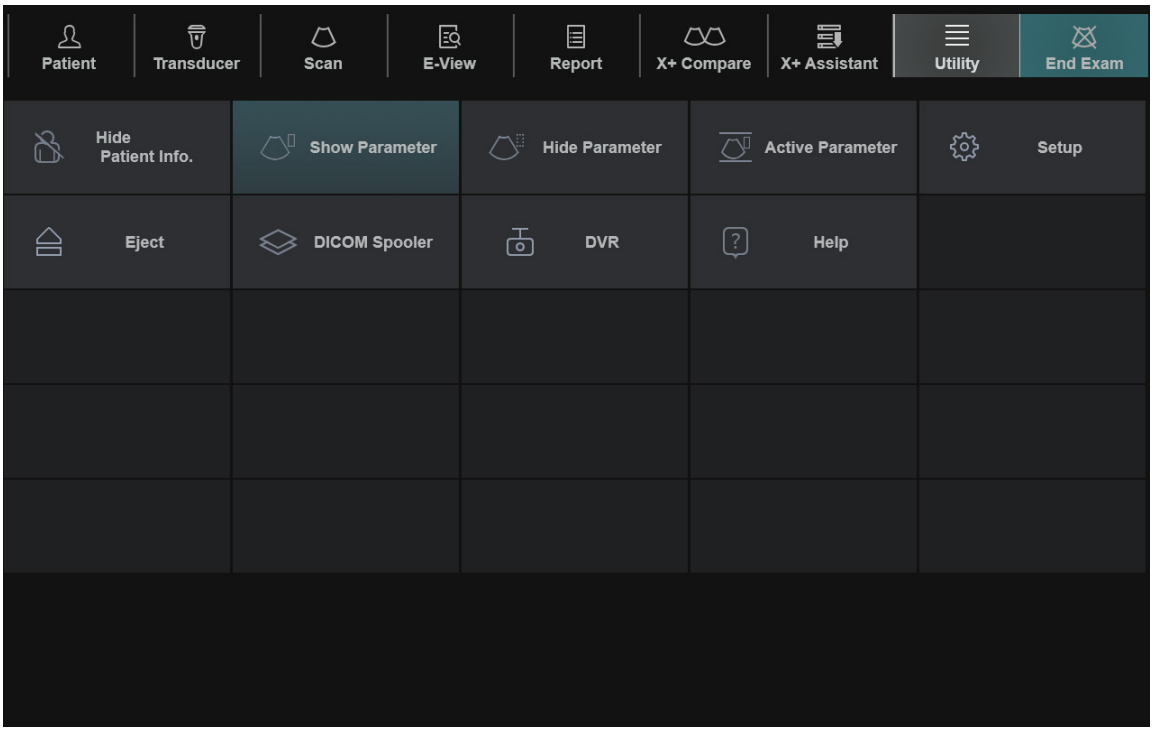


Figure 3-11 Shortcut Bar_Utility

Table 3-6 Exam functions on the Shortcut bar

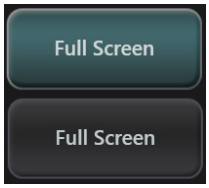
Function	Description
Patient	Access the ***Patient*** screen.
Transducer	Select the desired transducer, application, and preset.
Scan	Enter scanning mode screen.
E-View	Access the ***E-View*** screen.

Function	Description
Report	Access the ***Report*** screen.
X+ Compare	View dual image of a selected exam image and a live scan image.
X+ Assistant	Access the X+ Assistant Manager page.
Utility	Access the **Utility** menus. • **Hide Patient Info.**: Remove patient information from the scan screen. • **Show Parameter**: Display the parameter in the scan screen. • **Hide Parameter**: Remove the parameter from the scan screen. • **Active Parameter**: In multi-layout image mode, display the parameter for the active image. • **Setup**: Activate system configuration menus. You can change the various settings of the system. • **Eject**: Eject a media. • **DICOM Spooler**: Access the DICOM Spooler. • **DVR**: Access the **DVR** menu. It contains the controls to operate the DVD recorder. • **Help**: Access the electronic manual.
End Exam	End an examination. The system is ready for the next patient.

Tab Pages

The scanning mode controls are organized in Tab pages. The active mode can be changed by touching the corresponding tab.

There are different types of control buttons.

Control Button	Description
	Push button: Toggle the control between on and off states. Tap the control button to activate or deactivate the control. • Light blue = Activated • Gray = Deactivated
	Variable button: Control with variable adjustment. Tap ◁ or ▷ of the control button to adjust the parameter.

Soft Keys

There are six rotary/push buttons at the bottom of the touch screen. The functionality of these keys changes, based on the active mode and function.

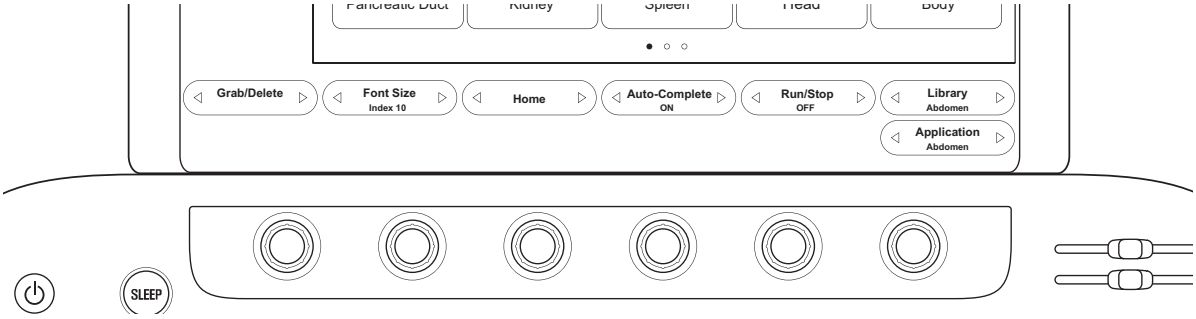
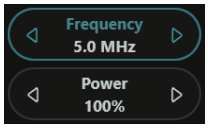
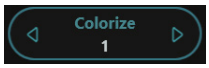


Figure 3-12 The Rotary/Push Buttons

The soft keys are used to select or adjust the functions in the soft menu.

Control Button	Description
	Press the soft key to select the function. • Light blue line = Activated • Gray line = Deactivated
	Rotate the soft key clockwise or counter-clockwise to adjust the parameter.

Transducers

The X-CUBE 70 ultrasound system provides various types of transducers. Most of them have a state of art in transducer technology: single crystal transducers, composite transducers, and extreme fine pitch transducer, and real-time mechanical 4D transducers

Moving and Storing Transducers

Transducers should be placed inside their holders for moving short distances. For shipping or moving considerably a long distance, storing transducers in their carrying cases are strongly recommended. Storing them in carrying cases is not only to protect the transducers from physical damage such as shock or vibration, but also it will protect them from environmental damages such as humidity and temperature.

NOTE

For more information about transducer, see "Transducer" on page 12-2.

4

Getting Started

This chapter introduces the followings:

Operating Requirements

The ultrasound system must operate in the appropriate environment according to the requirements described in this section. Make sure that the requirements have been met before using the system.

WARNING
All the warnings and cautions in the **"2. Safety"** should be read and understood before operating the system.

CAUTION
Do not install the system by yourself. Only ALPINION MEDICAL SYSTEMS service engineer should install the system.

NOTE
Only qualified sonographers or physicians should perform scanning with the system.

Electrical Requirements

You should use a system with the specified power outlet as follows:

- 100–120 VAC, 700 VA, 50–60 Hz
- 200–240 VAC, 700 VA, 50–60 Hz

WARNING
Operating the system with the wrong voltage range causes damages on the system, voiding the factory warranty.

Operating Environment

You should use this system in proper environment to prevent it from radio wave interference, dust and gas.

Make sure the area, which your system is installed, is well-ventilated, with a temperature, humidity, and pressure requirements. If the system is exposed to inappropriate temperature, humidity, or pressure, adapt your system to normal range of environment for a few hours.

WARNING
Operating the system within the inappropriate environment might cause unexpected problems.

Environmental Requirements

The ultrasound system requires constant maintenance of its operational environment. Different temperature and humidity requirements are specified for operation, storage and transportation.

Table 4-1 Environmental requirements

	Temperature	Humidity	Pressure
Operation	10 – 35 °C	30 – 75 %	700 – 1060 hPa
Storage	-25 – 60 °C	20 – 90 %	700 – 1060 hPa
Transportation	-25 – 60 °C	20 – 90 %	700 – 1060 hPa

CAUTION

Before powering the system on, make sure that the system meets the operational conditions in temperature and humidity.

Electromagnetic Interferences

The ultrasound system is approved for use in hospitals, clinics and other environmentally qualified facilities, in terms of the prevention of radio wave interference. The use of this system in an inappropriate environment may cause electromagnetic interference to radios and TVs around the medical equipment.

Take precautions to ensure that the system is protected from electromagnetic interference.

- Operate the system at least 4.5 meters (15 feet) away from the equipment that emits strong electromagnetic radiation.
- Special shielding may be required if the system is to be operated in the vicinity of radio broadcast equipment.

Powering the System

Connecting the System to the Electrical Outlet

WARNING

- To avoid circuit overload and possible loss of critical care equipment, make sure you do not have other equipment operating on the same circuit.
- The system's power must be supplied from a separate, properly rated outlet to avoid risk of fire.

1. Ensure that the wall outlet is of the appropriate type.
2. If necessary, push the **System On/Off** switch to turn off the system power on the bottom rear of the system.
3. Unwrap the power cable.
4. Attach the power plug to the system and secure it in place.
5. Push the power plug securely into the wall outlet.

NOTE

- Do not use an extension cord or adapter plug.
- Ensure easy access to the wall outlet to disconnect the power plug in case an emergency should occur.

6. Push the **System On/Off** switch to turn on the system power on the bottom rear of the system.

Power On

To power on the system,

1. Make sure that the power cord is plugged into the power outlet.

   CAUTION
   Make sure that the system power is supplied from a separate and properly rated power outlet.

2. Push the **System On/Off** switch to turn on the system power on the bottom rear of the system.
3. Press the **[Power On/Off]** key on the control panel.
4. The system boots up and the progress bar appears on the monitor.
5. After initialization is completed, the scan screen appears.
6. If the access control has been set by the system administrator, the ***System Log In*** window appears.
7. Enter the operator's ID and password, and then click **OK**.

Power Up Sequence

The System is initialized. During this time, the system boots up and the status is reflected on the monitor.

After initialization is completed, the backlights of all controls on the control panel turn on and the default 2D mode screen is displayed on the monitor.

NOTE
If no transducer is connected, the system goes into freeze mode.

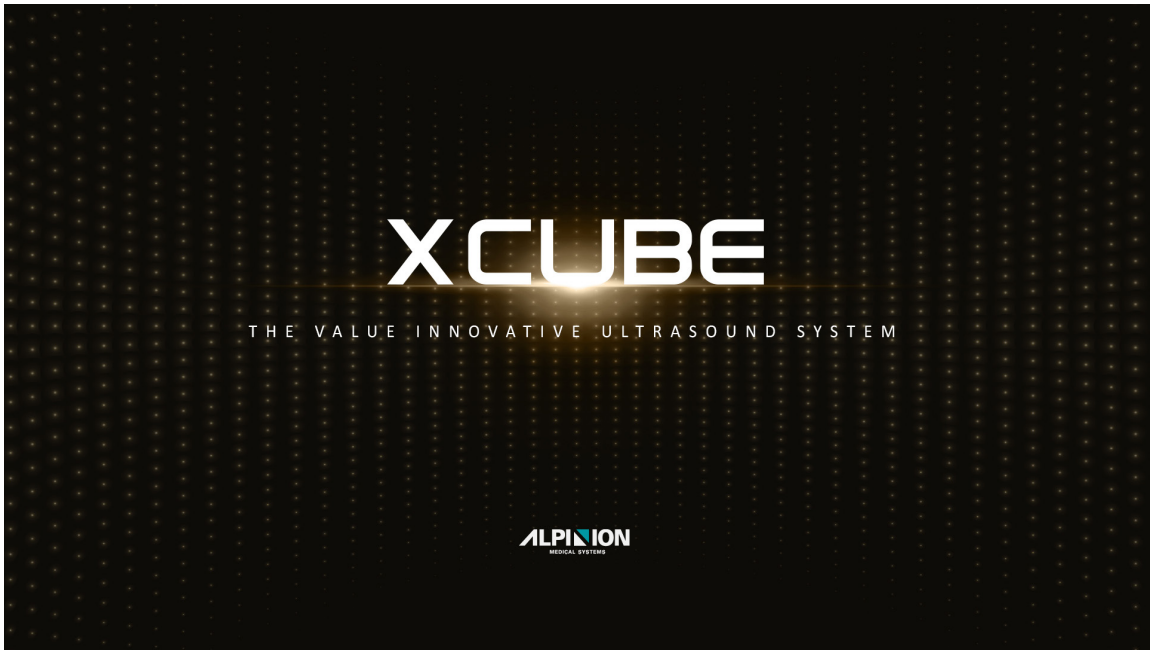


Figure 4-1 X-CUBE 70 Welcome Screen

System Protection

If the system access control has been set by the administrator, you can access the patient data in the system only after you log on the system.

NOTE

To set the system to log on automatically, go to **Utility** > **Setup** > **SystemPreset** > **Administration** > **Users** and select the **System Auto Login** check box.

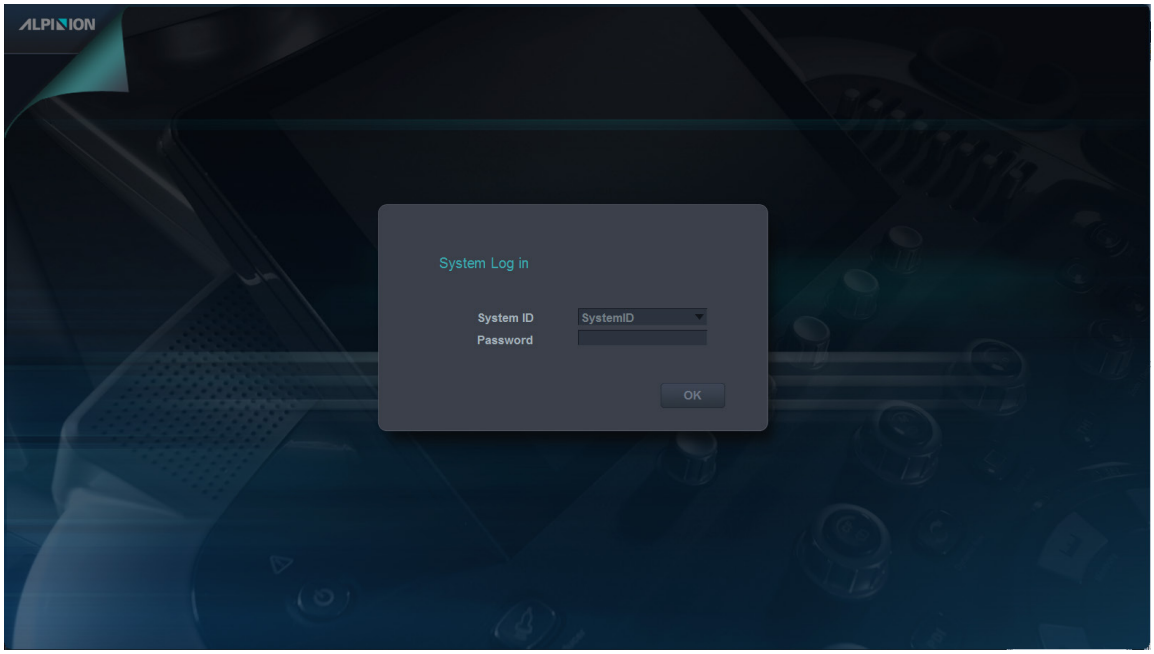


Figure 4-2 System Log In Window

Sleep Mode

You can use Sleep mode when not in use. Sleep mode allows quick startup of the system. If the optional battery is installed on the system, the system can be moved between exam locations in Sleep mode.

WARNING

Sleep mode is not intended to replace the shutdown process. The system should be fully shutdown every day.

To put the system in Sleep mode,

– Press the **[SLEEP]** key on the control panel, or disconnect the power cord.

To awaken the system,

– Press the **[Power On/Off]** key on the control panel.
The system returns to full functionality.

NOTE

When moving the system in Sleep mode, make sure the power cable is connected to the AC power source before exiting from Sleep mode.

Battery Power Mode

When AC power is lost or the power cable is unplugged, the system power is maintained by the battery.

While in Battery Power mode, the system cannot scan or perform post-processing, but can quickly start up once the AC power is re-established.

When in Battery Power mode

In Battery Power mode, the system monitor, touch screen, and control panel are turned off immediately to minimize battery usage.

NOTE

To shut down the system while in Battery Power mode, plug in the power cable, exit from Battery Power mode, and then perform regular shut down operations.

Recovering from Battery Power mode

The system recovers from Battery Power mode when you plug the power cable to the wall outlet and press the **[Power On/Off]** key on the control panel. The system returns to full functionality.

NOTE

When recovering from Battery Power mode, the default application of the current transducer is activated.

Viewing the current battery status

There is a battery icon on the status bar. With the battery icon, you can easily check the battery's current capacity.

Table 3-2 Battery status icon

Icon	Status	Note
	Battery is fully charged (95 – 100 %) and charging	AC power cable is plugged.
	Battery is partially charged (40 – 94 %) and charging	
	Battery is partially charged (20 – 39 %) and charging	
	Battery is partially charged (1 – 19 %) and charging	
	Battery level (0 %) and charging	

Charging battery

The battery is charged automatically when the system is connected to the wall outlet via the power cable and **System On/Off** switch is in the on position whether the system is turned on or off.

Power Off

CAUTION

Do not unplug the power cord during the system operation. Do not push the **System On/Off** switch before pressing the **[Power On/Off]** key. This may lead to data loss or system software damage.

NOTE

Depending on the power-off setting, you can activate Sleep mode or turn the system off immediately. The power-off setting can be configured in **Utility** > **Setup** > **SystemPreset** > **System** > **General** > **Power Off**.

To power off the system,

1. Press the **[Power On/Off]** key on the control panel.
2. When the ***Power off*** dialog box appears, click **Shutdown** by using **[Trackball]**.

NOTE

If the system has not fully shut down in 60 seconds, press and hold down the **[Power On/Off]** key until the system shuts down.

Moving and Transporting the System

Preparing the System to be Moved

CAUTION

- For your safety, you must follow the precautions carefully before moving or transporting the system.
- Before moving the system, make sure that the peripherals in the storage area are installed securely.

Before you move the system, use the following steps.

1. Power off the system using the **[Power On/Off]** key on the control panel.
2. Unplug the power cord from the power outlet.
3. Disconnect all peripheral devices (e.g. printers or DVD) and the footswitch from the system.
4. Loosely wind the power cable around the cable hook below the rear handle.

   CAUTION

   - To prevent damage to the power cord, DO NOT pull excessively on the cord or make sharp bends while wrapping.
   - Never allow the power cord to drag on the floor.
   - Never roll over the power cord with the wheels.
5. Store all transducers or accessories in the proper spaces carefully.

   CAUTION

   DO NOT place transducers into the side tray when moving the system. This is not a storage space for transducers.
6. Adjust the monitor and control panel to their lowest positions by using the Up/Down button.

   CAUTION

   To avoid injury or damage, make sure nothing is within the range of motion before adjusting the height. This includes both objects and people.
7. Push the Swivel button and adjust the location of the control panel.
8. Flip down the monitor.
9. Lock the monitor arm firmly in place.
10. Ensure that no loose items are left on the console and unlock the wheels.

Moving the System Safely

CAUTION

- For your safety, follow the precautions carefully when moving the system.
- Do not attempt to move the system using cables or transducer connectors.
- When you move the system with another person, take extra precaution not to injure feet.

When moving the system, use the following procedure.

1. Ensure that the control panel and monitor are in locked position.

   CAUTION
   Do not move the system if the control panel and monitor are in free position.

2. Grasp the front or rear handle grip and push and pull.
3. Take extra care when moving the system for long distances and on inclines.
   Ask for help, if necessary.
4. Take extra care to move the system when crossing door or elevator thresholds.
5. When you reach the destination, lock the front and rear casters.

Transporting the System

When transporting the system with vehicles, use the following procedure.

1. Only use vehicles that are capable of transporting your X-CUBE 70 system.
2. Load and unload the system to a vehicle parked on a level surface.
3. Ensure that the transporting vehicle can handle the weight of the system plus the passengers.
4. Ensure that the load capacity of the lift is capable of handling the weight of the system.
5. Ensure that the lift is in good working order.
6. Secure the system while it is on the lift so that it cannot roll. Use wood chocks, restraining straps, or other similar types of constraints. Do not attempt to hold it in place by hand.
7. Employ two to three persons to load and unload safely from a vehicle.
8. Load the system aboard the vehicle carefully and keep its center of gravity. Keep the system still and upright. (Do not lay the system down on its side.)
9. Ensure that the system is firmly secured while inside the vehicle. Any movement, coupled with the weight of the system, could cause it to break loose.
10. Secure the system with straps or as directed otherwise to prevent motion during the transport.
11. Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

Wheels

The wheels of the system are controlled by the pedals. Each wheel has an independent brake pedal.

WARNING

When two or more people are releasing the wheels, take extra precaution to prevent unexpected movement which could result in possible toe injuries.

CAUTION

- Examine the wheels frequently for any obvious defects that could cause them to break.
- Never move the system with locked wheels.
- If you temporarily left the system on a slope, you must use the brakes on the wheel. Do not leave the product on a slope.

Pedal Position	Function
Front	Swivel & Brake Lock
Rear	Swivel Lock

Reinstalling the System at a New Location

1. When the system is in place at a new location, lock the wheel brakes.
2. Connect the system to the electrical outlet.

NOTE

If any damage is found or the system does not work properly after you move it, contact your ALPINION MEDICAL service engineer or an authorized agent.

Adjusting the Control Panel

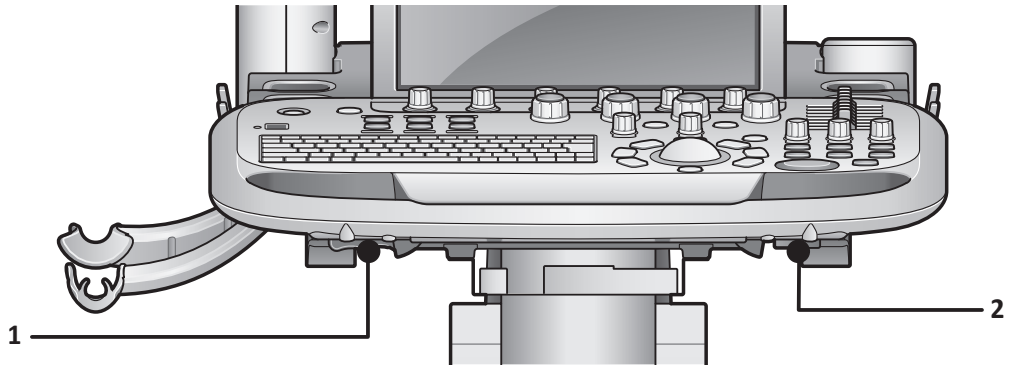


Figure 4-2 Swivel and Up/Down Buttons

No.	Component	No.	Component
1	Swivel button	2	Up/Down button

Adjusting the Height of the Control Panel

To raise/lower the control panel,

1. Hold the front handle in two hands.
2. Push and hold down the Up/Down button.
3. Raise or lower the control panel.
4. Release the Up/Down button at the desired height.

Adjusting the Location of the Control Panel

To swivel the control panel,

1. Hold the front handle in two hands.
2. Push and hold down the Swivel button.
3. Move the control panel to the left or the right.
4. Release the Swivel button at the desired position.

Adjusting the Monitor and Touch Screen

Adjust the Monitor Position

The position of monitor can be easily adjusted to fit your viewing by help of the monitor arm. When adjusting the position of the monitor and monitor arm, be sure to hold the monitor frame with both hands.

To position the monitor,

1. Turn the release knob clockwise to unlock the monitor.
2. Grasp the monitor firmly with both hands and do one of the followings:
   - Tilt the monitor forward or backward
   - Swivel the monitor left and right
   - Pan the monitor forward or backward

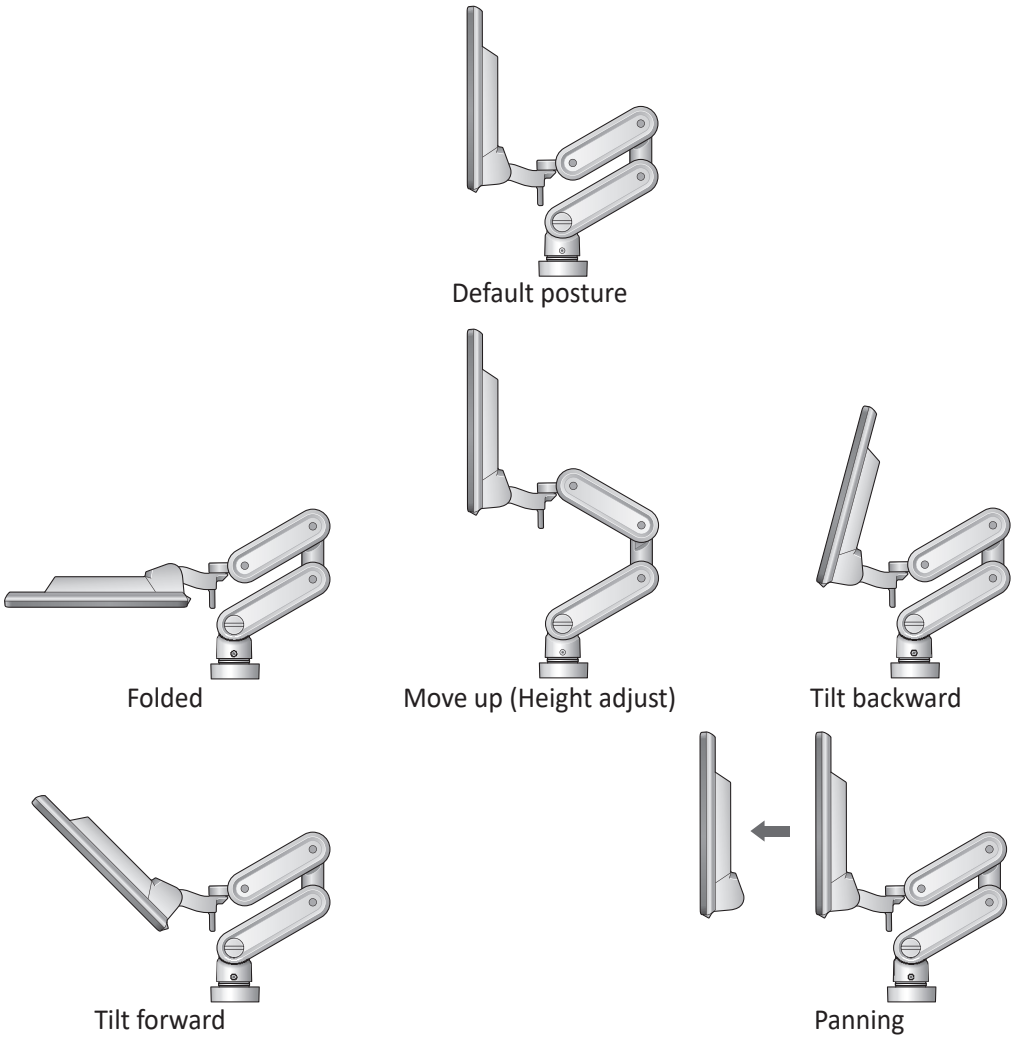


Figure 4-3 Adjusting the Monitor Position

Locking/Unlocking the Monitor

To lock/unlock the monitor arm,

1. If necessary, flip down the monitor.
2. Turn the release knob clockwise to unlock the monitor. The monitor can be moved freely in all directions.
3. Turn the release knob counter-clockwise to raise the lock and move the monitor into the parked position.

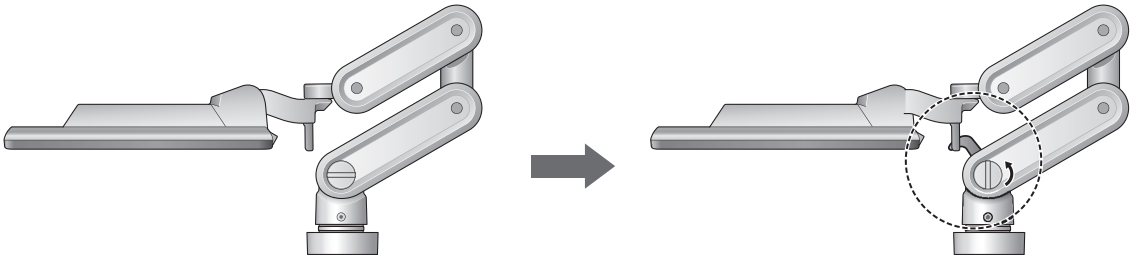


Figure 4-4 Locking the Monitor Arm

Adjusting the Monitor's Contrast and Brightness

To adjust the brightness of the monitor,

1. Press the **Mode/Select** (◇) button on the monitor once.
2. To increase the brightness, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the brightness. Repeat step 2 until desired value reached.

To adjust the contrast of the monitor,

1. Press the **Mode/Select** (◇) button on the monitor twice.
2. To increase the contrast, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the contrast. Repeat step 2 until the desired value is reached.

Adjusting the Touch Screen's Contrast and Brightness

To adjust the brightness of the touch screen,

1. Press the **Mode/Select** (◇) button on the touch screen once.
2. To increase the brightness, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the brightness. Repeat step 2 until desired value reached.

To adjust the contrast of the touch screen,

1. Press the **Mode/Select** (◇) button on the touch screen twice.
2. To increase the contrast, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the contrast. Repeat step 2 until the desired value is reached.

LED Lamp

The LED lamp is adapted to offer proper light at a dark room to see the chart or readings. To turn the light on, press the **LED Lamp** button. Press this button once again to turn this lamp off.

Connecting/Disconnecting the Transducer

Connecting the Transducer

You can connect the transducer to the transducer port when the system is powered off or on. Make sure that you press the **[Freeze]** key on the control panel before connecting the transducer.

CAUTION
Do not touch the patient when connecting or disconnecting a transducer.

1. Check if you press the **[Freeze]** key on the control panel.
2. Insert the transducer connector into the transducer port.
   The CW transducer should be connected to CW port on the front panel of the console.

   CAUTION
   Do not forcibly insert the transducer connector to the system. Improper connection may cause damages to the system and transducer.
3. Push the connector locking lever to the right to secure the transducer connector.

   NOTE
   When connecting the transducer, do not push the locking lever if resistance is felt. Remove the transducer connector and check for misaligned or damaged pins. If any damaged pins are found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.
4. Put the transducer in the transducer holder.

   CAUTION
   Do not allow the transducer head to hang free. Impact to the transducer head could result in irreparable damage.

Disconnecting the Transducer

You can disconnect the transducer from the transducer port when the system is powered off or on. Make sure that you press the **[Freeze]** key on the control panel before disconnecting the transducer.

CAUTION
Do not touch the exposed surface of the transducer connector when the transducer is removed.

1. Check if you press the **[Freeze]** key on the control panel.
2. Push the connector locking lever to the left to release the transducer connector.
3. Pull out the transducer connector from the transducer port.

Activating/Deactivating the Transducer

Activating the Transducer

Use the following procedure to activate the transducer and application.

1. Select **Transducer** on the touch screen.
   The dialog box for transducer and application selection appears.
2. Select the desired transducer, application and preset on the touch screen.

   NOTE

   Default transducer for the selected preset or default preset for the selected transducer is selected automatically.
3. Click **Exit** to complete the transducer selection.

   NOTE

   Selecting the **Automatic Preset selection when changes the Transducer** check box shows the default application and preset for the selected transducer.

CAUTION

Make sure that the transducer and application names displayed on the screen correspond to the actual transducer and application selection.

Deactivating the Transducer

NOTE

Before deactivating the transducer, press the **[Freeze]** key on the control panel. An error may occur when you deactivate the transducer while the system is running.

Use the following procedure to deactivate the transducer.

1. Press the **[Freeze]** key on the control panel.
2. Gently wipe the excess gel on the transducer surface.
3. Place the transducer in its holder.

Starting an Exam

You can start an exam by entering patient data into the system. The system uses a unique ID to identify each patient. You can enter an ID, or you can have the system create one automatically.

The patient's name and ID number are retained with each patient's image, and are transferred with each image during archiving or hard copy printing.

When completing the patient registration, you can acquire images, perform measurement and calculation, save images to the image archive, and send the images to a DICOM device.

CAUTION

Always verify the patient ID to avoid patient identification errors. Make sure that the patient ID is displayed correctly on the patient banner and report screen.

Patient Screen

The following components are shown on the screen:

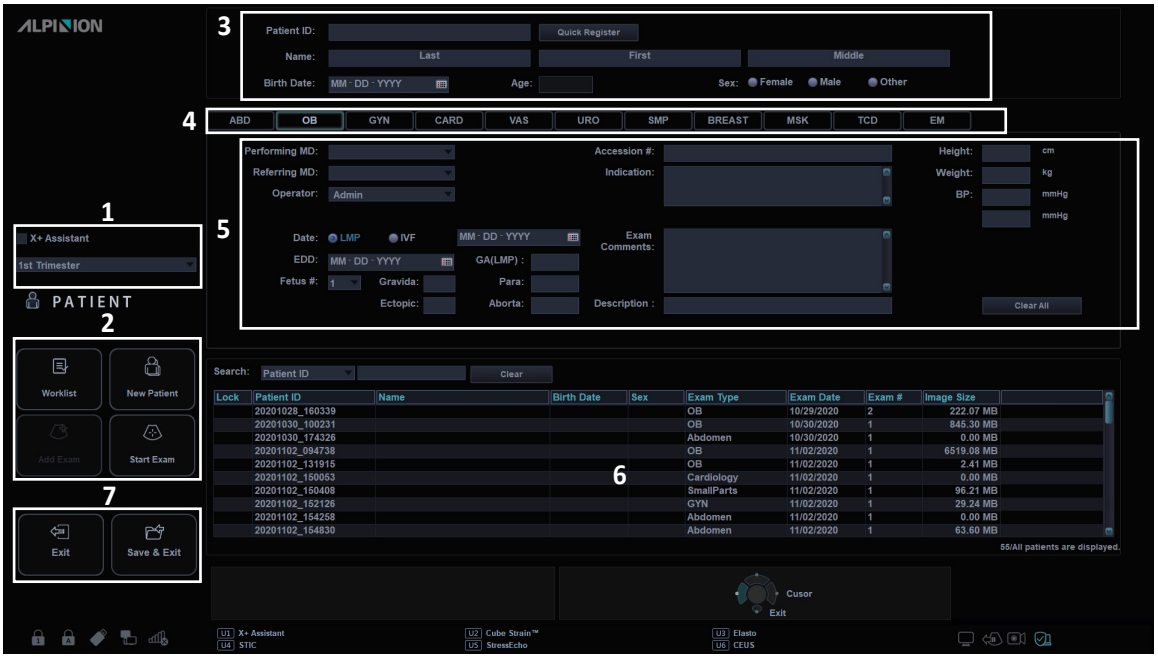


Figure 4-4 Patient Screen

Table 4-2 Patient screen

No	Function	Description
1	**X+ Assistant**	Use to to link an exam with X+ Assistant when the exam starts. • **Protocol List**: Provide a protocol list for the application.
2	**Function selection**	• **Worklist**: Use to retrieve patient data from the worklist server. • **New Patient**: Use to clear patient entry screen in order to input a new patient's data into the database. • **Add Exam**: Use to create a new study on an existing patient. • **Start Exam**: Start the exam for the patient. • **Continuous Exam**: Continues the exam for that patient if you select the last exam of the day.
3	**Patient information**	• **Patient ID**: Identification code for a patient • **Name**: Patient's last, first, and middle name • **Birth Date**: Patient's birth date • **Age**: Patient's age • **Sex**: Female, Male, Other
4	**Application selection**	Select from 11 exam application categories.
5	**Exam information**	Show the current/active exam information. All possible information needs to be entered.
6	**Patient list/Study list**	Display either patient or study list.
7	**Save & Exit, Exit**	Use to save all changes and exit the ***Patient*** screen.

To enter the ***Patient*** screen,

– Touch **Patient** on the touch screen.

To enter the patient information,

– Place the cursor on the text field you want to edit, and then enter the patient information using the alphanumeric keyboard.

To navigate through each field on the ***Patient*** screen,

– Use the **[TAB]** or **[Enter]** key on the QWERTY keyboard. You can use **[Trackball]** and the **[Set]** key on the control panel to move and fix the cursor.

To automatically generate a patient ID with current date and time,

– Go to **Utility** > **Setup** > **SystemPreset** > **System** > **Patient Info** and select the **Auto ID Generation** check box.

– Press the **[Quick ID]** key on the QWERTY keyboard and select the **Auto ID Generation** check box on the ***Quick ID*** screen.

– Select **Quick Register** on the touch screen.

Patient Menu

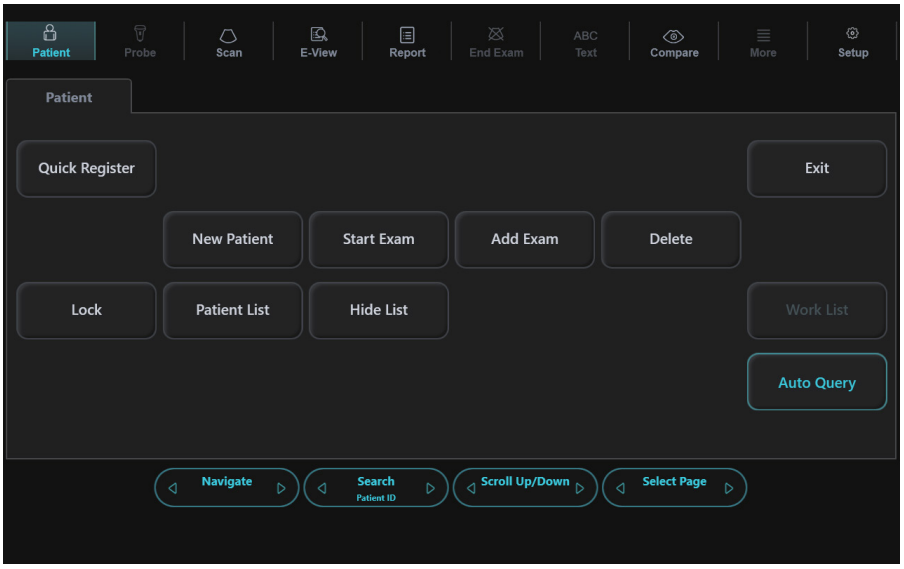


Figure 4-5 Patient Touch Screen

Table 4-3 Patient screen menus

Function	Description
Quick Register	Generate a patient ID automatically with current date and time.
New Patient	Use to clear patient entry screen in order to input a new patient's data into the database.
Start Exam	Start the exam for the patient.
Continue Exam	Continue the exam for the patient if you select the last exam of the day.
Add Exam	Use to create a new study on an existing patient.
Delete	• Delete one or more patient records from Patient list. • Delete one or more studies from Study list.
Lock/Unlock	Lock the patient data or study to prevent move and delete functions.
Patient List	List the patients in the database.
Study List	Display the list of all the exams for the current patient.
Hide List	Hide the Patient list or Study list.
Worklist	Use to retrieve patient data from the worklist server.
Auto Query	Automatically queries the worklist server.
Navigate	Navigate through each field on the ***Patient*** screen.
Search	Select a search criteria.
Scroll Up/Down	Use to scroll through the Patient list/Study list.
Select Page	Use to move to the next page of the Patient list/Study list.
Exit	Use to exit the ***Patient*** screen.

Starting a New Patient's Exam

1 Touch **Patient** on the touch screen. The ***Patient*** screen appears.

2 The cursor positions on the ***Patient ID*** field. Enter the patient information using the alphanumeric keyboard. The ***Patient*** screen includes the following patient information fields.

Table 4-4 Patient information

Field	Description	Remarks
Patient ID	Identification code for a patient	Maximum 64 characters are supported. Use a unique ID for each patient.
Name	Patient's last, first, and middle name	Each of last name, middle name, and first name supports maximum 62 characters and the total name supports maximum 62 characters.
Birth Date	Patient's birth date	Click the calendar icon and select a date on the calendar. You can also manually enter a date.
Age	Patient's age	Automatically calculated when birth date is entered. You can also manually enter an age.
Sex	Female, Male, Other	

3 Select the desired application from exam application categories. When a category is selected, the measurement and category presets are displayed.

4 Enter the required application information for the selected application.

- **ABD application**

  No specific application data

- **OB and EM application**

Table 4-5 OB and EM application

Field	Description
LMP/IVF	Select LMP or IVF first to calculate EDD and enter the date of the last menstrual period (or In Vitro Fertilization). LMP or IVF is automatically calculated when you enter GA.
EDD	Estimated Date of Delivery. The system automatically calculates and displays EDD after entering GA, LMP or IVF. When you enter or change EDD, the system calculates and displays values for LMP/IVF and GA. EDD = LMP + 280 days
GA	GA is automatically calculated when you enter LMP, IVF or EDD. GA (Gestational Age) = Current date - LMP You can also type the GA weeks and days. LMP/IVF and EDD fields are updated accordingly.
Fetus #	Select the fetus number (up to 4 fetuses).
Gravida	Enter the number of pregnancy.
Para	Enter the number of childbirth.

Field	Description
Ectopic	Enter the number of ectopic pregnancy.
Aborta	Enter the number of abortion.

GYN application

Table 4-6 GYN application

Field	Description
LMP	Enter the date of the last menstrual period using the selected date format (ex – MM/DD/YYYY).
Expected Ovulation Date	Enter an expected ovulation date.
Day of Cycle	Enter a menstrual cycle.
Gravida	Enter the number of pregnancy.
Para	Enter the number of childbirth.
Ectopic	Enter the number of ectopic pregnancy.
Aborta	Enter the number of abortion.

Cardio application

Table 4-7 Cardio application

Field	Description
BSA	Body Surface Area (Calculated, No input data)

Vascular application

Table 4-8 Vascular application

Field	Description
Left BP	Blood pressure of left arm, using the systole over diastole measurement in mmHg
Right BP	Blood pressure of right arm, using the systole over diastole measurement in mmHg
ABI	Ankle Brachial Index

Urology application

Table 4-9 Urology application

Field	Description
PSA	Enter the value of the Prostate-specific antigen.
PPSA coef.(1)	Enter the first value of the predicted PSA coefficient.
PPSA coef.(2)	Enter the second value of the predicted PSA coefficient.

Pediatrics application

No specific application data

Small Part application

No specific application data

5 Enter the general application information.

Table 4-10 General application information

Field	Description
Height	Enter the patient's height using selected dimension (cm, ft, inch).
Weight	Enter the patient's weight using selected dimension (kg, lb, oz).
BP	Enter the maximum/minimum blood pressure. Blood pressure in mmHg
Accession #	Maximum 16 characters Identification code indicating the sequence of the current study as related to other studies for this patient. Usually generated by a HIS or RIS server.
Exam Comments	Enter comments about the exam. Maximum 144 characters
Indication	Maximum 72 characters
Performing MD	Enter the name of the physician who diagnosed the patient.
Referring MD	Enter the name of the physician who requested the exam.
Operator	Enter the name of the sonographer who scanned the patient.
Description	Enter a description of the diagnosis. Maximum 64 characters

NOTE

- The measurement unit can be configured in **Utility** > **Setup** > **SystemPreset** > **System** > **General** > **Location** > **Unit**.
- When you change the operator ID on the ***Patient*** screen, the ***Log in*** dialog box appears on the screen. Select the desired operator ID from the ***Operator ID*** field and enter a valid password into the ***Password*** field, and then click **OK**.

6 Click **Save & Exit** or select **Start Exam** on the touch screen to save the patient and application information. The scan screen appears.
If you click **Exit**, return to the scan screen without saving the patient and application information.

CAUTION

Always verify the identification with the patient to avoid patient identification errors. Make sure that the correct patient identification appears on all screens before printing out the patient information.

Quick ID

With the Quick ID feature, you can quickly register a patient by entering the basic patient information. This feature is useful when you do not have enough time to register all patient information.

1 Press the **[Quick ID]** key on the QWERTY keyboard. Or select **Quick Register** on the touch screen. The ***Quick ID*** screen appears.

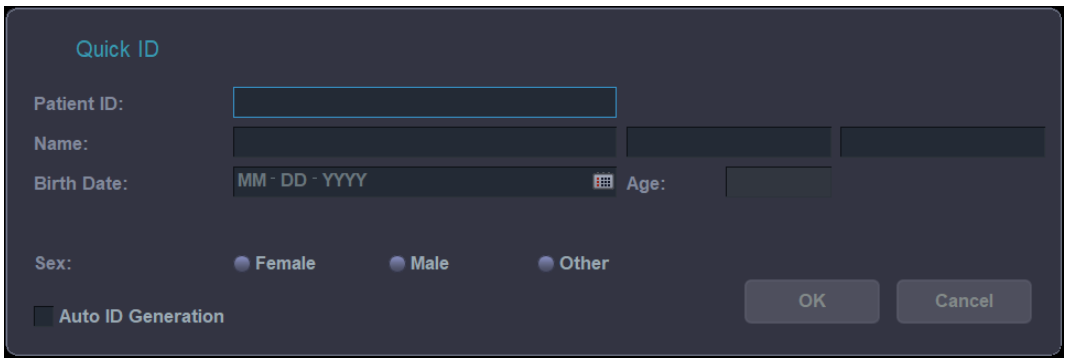


Figure 4-6 Quick ID Screen

2 Enter the patient information: Patient ID, Name, Birth Date, Age and Sex. Only OB application shows the LMP and EDD fields.

NOTE

Using the **[TAB]** or **[Enter]** key on the QWERTY keyboard allows you to navigate through each field on the ***Quick ID*** screen. You can use **[Trackball]** and the **[Set]** key on the control panel to move and fix the cursor.

3 Click **OK** to save the patient information.

Starting a New Exam on an Existing Patient

NOTE

When you register a patient, the study list appears on the display. If the patient is not registered, the patient list appears instead.

1. Touch **Patient** on the touch screen. The ***Patient*** screen appears.
2. Select a search criteria (Patient ID, Patient Name, Birth Date, Sex, Exam Date, and Locked) from the ***Search*** drop-down list and enter a search keyword.

   NOTE

   To view all registered patients while entering a search keyword, click **Clear**.
3. The list of patients who match the criteria is displayed in the patient list.
4. Select a desired patient from the patient list.
5. If necessary, enter or edit the patient information.
6. Select **Add Exam** on the touch screen to create a new study.
7. Select **Start Exam** on the touch screen to return to the scan screen.
8. Perform an exam.
9. Store the raw data to the clipboard.

Ending an Exam

When you end an examination, all images of the current study are saved in the local hard disk.

- Press the **End Exam** key on user-defined key to save the current study.
- Press the **[End Exam]** key on the QWERTY keyboard to save the current study.
- You can also end a study by selecting **New Patient** on the ***Patient*** screen.

NOTE

You can return to the ***Patient*** screen after ending the current study. To configure, go to **Utility** > **Setup** > **SystemPreset** > **System** > **General** > **After End Exam**.

Retrieving Patient Information via Worklist

1. Touch **Patient** on the touch screen. The ***Patient*** screen appears.
2. Select **Worklist** on the touch screen to view patient data from the default worklist server.
3. To change the worklist server, select a source from the ***Source*** drop-down list.

   NOTE

   Before connecting to the worklist server, you need to configure worklist settings. To configure worklist settings, go to **Utility** > **Setup** > **SystemPreset** > **Connectivity** > **Worklist**.

4. Select **Worklist** to retrieve patient data from the worklist server.
   The search results appear on the list.
5. Select the patient you want to start a study.
6. Select **Transfer** on the touch screen to transfer the selected study to the patient archive.

   NOTE

   Destination for transfer is always Local Archive HDD.

7. Enter the required information and start an exam.

Retrieving and Editing Archived Information

Searching for an Existing Patient

1. Touch **Patient** on the touch screen. The ***Patient*** screen appears.
2. Select a search criteria (Patient ID, Patient Name, Birth Date, Sex, Exam Date, and Locked) from the ***Search*** drop-down list and enter a search keyword.
   If you select Exam Date, you can select a desired period (Today, Last Week, Last Month, and Last 3 Months) and a specific date from the drop-down list.

   NOTE

   To view all registered patients while entering a search keyword, click **Clear**.
3. The list of patients who match the criteria is displayed in the patient list.

Sorting the List

Sort the patient or study information by clicking the column names (e.g. Lock, Patient ID, Name, Birth Date, Sex, Image Size, Exam Type, Exam Date, and Exam #) of the patient or study list in ascending or descending order.

Changing Patient Information or an Exam

If patient information needs to be edited, you can modify the information on the ***Patient*** screen without erasing accumulated patient images, measurements, annotations, calculations and worksheets.

CAUTION

The user is responsible for patient data, diagnostic information or any other patient related information entered in the database.

1. Touch **Patient** on the touch screen. The ***Patient*** screen appears.
2. Select a search criteria (Patient ID, Patient Name, Birth Date, Sex, Exam Date, and Locked) from the ***Search*** drop-down list and enter a search keyword. The system automatically searches to see if the patient is already in the database.
3. The appropriate patient is displayed.
4. Modify the patient information or the exam application category.

   NOTE

   Patient identification information cannot be modified.
5. When you have finished, click **Save & Exit** to save the changes.
   A new study is automatically created on that patient.

Locking a Patient or Study

To prevent deleting or moving patient data, use Lock functionality.

Locking the existing patient

1. Search and select a patient from the patient list.
2. Select **Lock** on the touch screen.
3. You can see the locked patient with the lock icon in the patient list.

NOTE

When you select a locked patient, you can see all of the studies are locked.

Locking the existing study

1. Select a study from the study list.
2. Select **Lock** on the touch screen.
3. You can see the locked study with the lock icon in the study list.

NOTE

To unlock the locked patient or study, select **Unlock** on the touch screen.

Deleting the Existing Patient or Study

CAUTION

Before deleting a patient or study, make sure you have already backed up the patient data using Backup Patient Archive or export function. After deleting the patient or study, you CANNOT recover it.

NOTE

To select multiple patients from the patient list, press the **[Set]** key while the **[Ctrl]** or **[Shift]** key is pressed.

Deleting the existing patient

NOTE

To switch between the patient list and the study list, use **Patient List** or **Study List**.

1. Search and select a patient from the patient list.
2. Select **Delete** on the touch screen.
3. When the ***Message*** dialog box appears, click **Yes** to delete the selected patient.

NOTE

When the patient you want to delete is locked, you cannot delete the patient by using **Delete**. You have to unlock the locked patient before deleting it.

Deleting the existing study

1. Select a study from the study list.
2. Touch **Delete** on the touch screen.
3. When the ***Message*** dialog box appears, click **Yes** to delete the selected study.

NOTE

When the study you want to delete is locked, you cannot delete the study by using **Delete**. You have to unlock the locked study before deleting it.

5

Customizing the System

This chapter describes the preset features that you can configure the default settings of your system.

Presets

You can customize the system to increase efficiency and streamline your workflow. The preset menus provide the following functionality.

- **System Preset**: View and set the configuration parameters of operating the system and maintaining the setup data.
- **Image Preset**: View and set the exam and imaging parameters.

Customizing the System

To customize the system,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch a tab that has the information you want to change.
4. Select the appropriate touch menu.
5. Specify the settings for each item.
6. When you have finished, click **Save & Exit** to save the changes and return to scanning.
   In some cases, you may need to reboot the system for the change to take effect.

System Preset

The System Preset function is designed to set the configuration parameters of operating the system and maintaining the setup data.

In each preset menu, you can configure default settings for its submenus.

System Preset Display

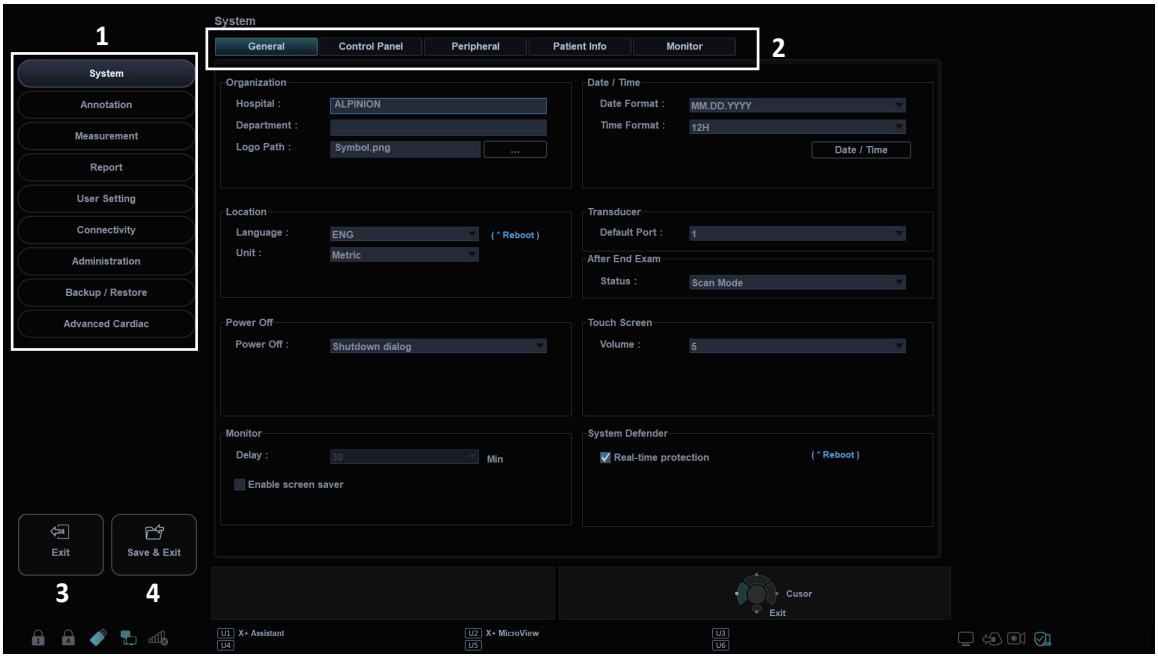


Figure 5-1 System Preset Display

1	System presets	**3**	Exit
2	Preset menus	**4**	Save & Exit

System Preset Touch Screen

To access preset menus, select the desired menu on the touch screen.

NOTE

After changing some preset parameters, you may need to reboot the system.

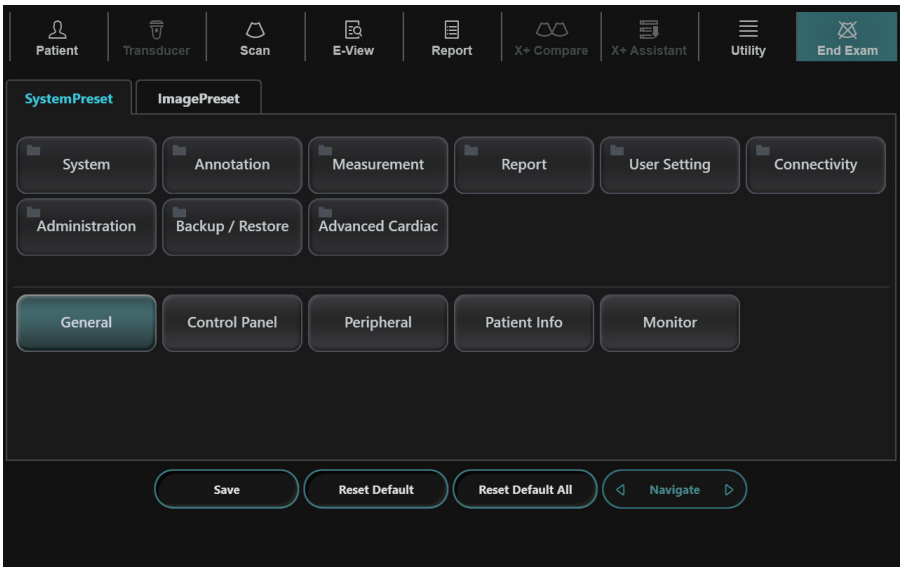


Figure 5-2 System Preset Touch Screen

Table 5-1 System presets

Preset	Description
System	Customize the system configurations such as general settings, control panel, peripheral, patient info, and monitor calibration.
Annotation	Customize the comment and body pattern settings.
Measurement	Customize the labeled measurement for each study and create a new measurement and OB table.
Report	Customize the report and report print settings.
User Setting	Customize the user-defined settings.
Connectivity	Customize the DICOM device and service.
Administration	Create a user ID, activate the service browser, and view the option information.
Backup / Restore	Back up and restore data, and perform full backup for image data.
Advanced Cardiac	Customize the settings for the Stress echo and Cube strain™ functions.

General Workflow

Accessing System Preset menus

To access the preset menu,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **SystemPreset** tab on the touch screen.
   The ***System Preset*** screen appears.
4. Select the appropriate preset you want to specify.
5. Select the preset menu on the touch screen.

Changing System Preset parameters

To change system parameters,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **SystemPreset** tab on the touch screen.
   The ***System Preset*** screen appears.
4. Select the appropriate preset you want to specify.
5. Select the preset menu on the touch screen.
6. Change values for the parameters you want to change.
   To change a parameter, do one of the following:
   - Enter the desired value using the keyboard in the text box.
   - Select the value from a drop-down list.
   - Select or clear a check box.
   - Click one value from a choice of two or more radio buttons.
7. When you have finished, click **Save & Exit** to save the changes and return to scanning.
   In some cases, you may need to reboot the system for the change to take effect.

NOTE

- To restore the settings on the current menu screen, click **Reset Default**.
- To restore all settings of the system preset, click **Reset Default All**.

System

The **System** preset allows you to configure general system settings and to calibrate a monitor.

The **System** preset contains the following submenus:

- General
- Control Panel
- Peripheral
- Patient Info
- Monitor

General

The **General** menu allows you to configure the general system settings such as hospital name, system date and time, and screen saver.

Organization

- **Hospital**: Enter a hospital name.
- **Department**: Enter a department name.
- **Logo Path**: Import a hospital logo to be shown on the top of the display.

To import a hospital logo from a USB drive,

1. Insert a USB driver that stores a hospital logo to the system.
2. Click **...** to find the file path.
3. When the file selection dialog box appears, select the logo file you want.
4. Click **OK**.

NOTE

- The supported file formats are BMP, PNG, and JPG only.
- You may not import a hospital logo from a CD or DVD.

Location

- **Language**: Change the display language.

  NOTE

  After changing the language, you need to reboot the system.

- **Unit**: Select a measurement unit, **Metric** or **US**. When you select **US**, all units are changed from centimeter to inch.

Power Off

- **Power Off**: Set how the system powers off when you press the **[Power On/Off]** key.
  - **Shutdown dialog**: Set to show the shutdown dialog box.
  - **Immediately**: Set to power off immediately.

Monitor

- **Enable screen saver**: Set to activate Screen saving mode.
- **Delay**: Specify the time of inactivity.

Date / Time

- **Date Format**: Select the desired date format.
- **Time Format**: Select the desired time format.

To change the current date and time,

1. Click **Date / Time** under **Time Format**.
2. Click the **Date and Time** tab.
3. Click **Change date and time...** to change the current date and time. ***Date and Time Settings*** screen appears.
4. Change the current date and time.
5. Click **OK** to save the changes.

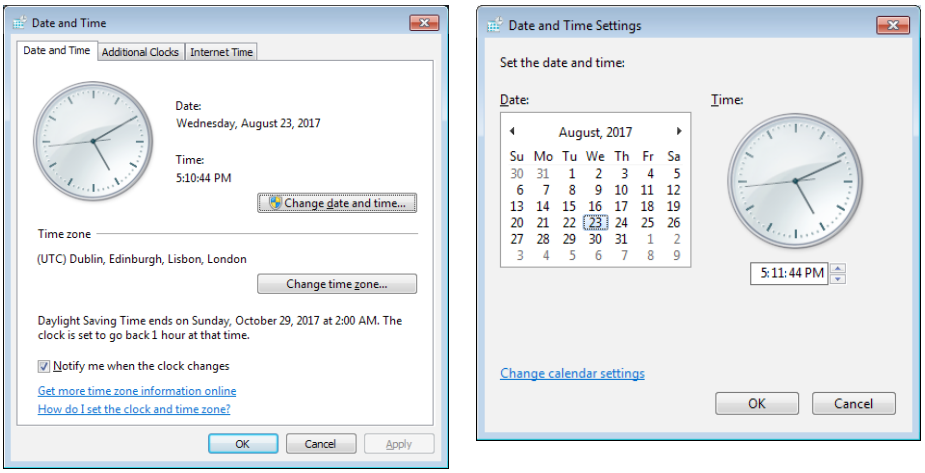


Figure 5-3 Date and Time

To change the time zone,

1. Click **Date / Time** under **Time Format**.
2. Click the **Date and Time** tab.
3. Click **Change time zone...** to change the time zone.
   Time Zone Settings screen appears.
4. Select your time zone from the drop-down list.
5. To set Daylight Savings Time (DST), select the **Automatically adjust clock for daylight saving changes** check box.
6. Click **OK** to save the changes.

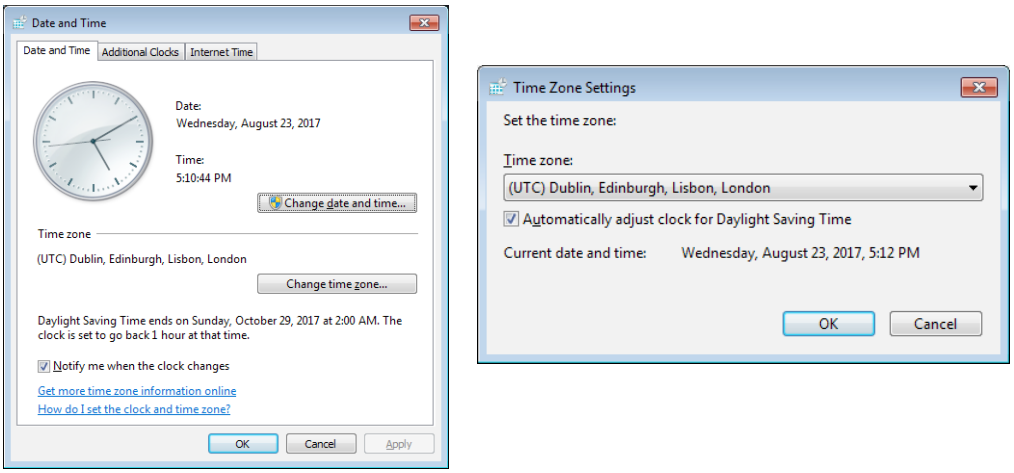


Figure 5-4 Time Zone

Transducer

- **Default Port**: Select a default transducer port when the system powers on.

After End Exam

- **Status**: Set to return to scanning or go to ***Patient*** screen when you touch **End Exam** on the touch screen.

Touch Screen

- **Volume**: Adjust the volume of the touch screen.

System Defender

- **Real-time protection**: Enable or disable the automatic protection feature which checks the system for suspicious activity in real-time.

NOTE

After turning on or off the real time protection feature, you need to reboot the system.

Control Panel

The **Control Panel** menu provides options for trackball and the control panel keys.

Trackball

- **Trackball Travel Speed**: Change the trackball speed (Slow, Medium, Fast).
- **Trackball Cine Speed**: Change the speed for scrolling through cine sequences (Slow, Medium, Fast).

Key

- **Application**: Select a default application that is used for the selected function on freezing.
- **Active Function on Freeze 2D**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in 2D mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Active Function on Freeze M**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in M mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Active Function on Freeze D**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in Doppler mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Backlight Intensity**: Set the brightness of the key backlight (High, Low, Off).
- **Set the Cursor and Set keys**: Select the functions to assign to the **[Set/Cur]** keys on the left and right sides of the trackball on the control panel.
  - **Cursor - Set**: Assign **Cursor** to the left key and **Set** to the right key.
  - **Set - Cursor**: Assign **Set** to the left key and **Cursor** to the right key.
  - **Set - Set**: Assign **Set** to the left key and **Set** to the right key.
  - **Set - Exit**: Assign **Set** to the left key and **Exit** to the right key.
  - **Exit - Set**: Assign **Exit** to the left key and **Set** to the right key.

  NOTE

  TIC is available when you assign the functions to **[Set/Cur]** keys as **Cursor - Set** or **Set - Cursor**.
- **CCW Depth Control**: Set to operate the **[Depth]** key when you rotate the key counter-clockwise.
- **Switch Dual(Quad) and P3(P4)**: Switch the key function between the **[Dual]** key and **[P3]** key, or between the **[Quad]** key and **[P4]** key.

Audio

- **'Beep' sound only when the 'P1,P2,P3,P4'key are Pressed**: Set to play a beep when you press the **[P1]**, **[P2]**, **[P3]**, and **[P4]** keys.

Peripheral

The **Peripheral** menu provides peripheral options for VCR, standard printer, and RS232C port.

NOTE

To configure the printer key function, go to **User Setting** > **Print/Foot Switch**.

VCR

- **VCR**: Select the type of media (DVR media, USB).
- **VCR Format**: Select the video format (NTSC or PAL, MPEG or AVI).
- **VCR Maximum Time (min.)**: Select the record length (1-20). (Only available for USB storage.)

Standard Printer(Report Only)

- **Default Printer**: Select a default standard printer that is used for printing reports and images.
- **Printer Paper**: Select a printing paper for the default printer.
- **Refresh**: Set the system to automatically refresh the printer list when you add a new printer. Select this option after installing a new printer is completed.

Printer Setting

- **Add Printers...**: Add a new printer driver via USB serial port or Ethernet interface. Selecting this option activates Windows Add Printer wizard.
- **Cleanup Printer Jobs in Queue When System Bootup**: Set to clear all printer jobs in queue when your system reboots.
-  : Click the setting icon to manage the printer list.

RS232C

- **COM**: Select a RS232C port setting, **DVR Control** or **Transfer Measurement**.

Patient Info

The **Patient Info** menu provides useful options related to patient management and E-View, and allows you to configure the patient banner display option.

Patient Information

- **Hide Patient Information**: Select to hide patient information on patient banner.
- **Patient Banner Line1**: Select the patient information to display patient banner line1 from the drop-down list.
- **Patient Banner Line2**: Select the patient information to display patient banner line2 from the drop-down list.
- **Image View: Hide Banner**: Select to hide patient banner on acquired data on E-view.

Patient Package Option

- **Auto ID Generation**: Set the system to automatically create a new patient ID when you select **New Patient**.
- **Auto Search for Patient**: Set the system to automatically search for the patient data when you enter the first letter of a patient ID in the ***Patient ID*** field.
- **Auto Logon**: Set the system to log on automatically.
- **Auto Archiving Patient Data**: Set the system to archive the patient data automatically.
- **Use Birthdate**: Set the patient's age is calculated when enter the birth date.
- **Quick Worklist**: Set the worklist is shown automatically when you touch **Patient** on the touch screen.
- **Keep last sorting method in patient list**: Select to display the last sorting method on the ***Patient Package List*** screen.
- **Keep the last Column width of Patient List**: Select to save the last column width when you change the column width of the patient list.
- **Auto Query for Worklist**: Set the system to query the worklist server automatically.
- **Auto Start Exam for Worklist**: Set the system to start an exam automatically from Worklist server.
- **The first letter of the patient name is always capitalized:** Set the system to automatically capitalize the first letter of the patient name.
- **Hide the patient list on the patient registration Page**: Set to hide patient list on the patient registration page.
- **Delete patient Data that has been transferred to PACS:** Set the system to delete patient data that has been transferred to PACS automatically after selected amount of period.

Archive Option

Select an archive to be used for saving data when you select **End Study**. You can also add and remove a storage media such as DICOM device, USB flash drive, USB hard disk, or Network storage.

NOTE

The default archive **"Local Archive"** cannot be deleted.

App. Storage

Select to set PACS to transfer data by application.

Monitor

The **Monitor** menu allows you to adjust the display pattern using gray bars and color bars. After the monitor adjustment, you need to check your peripherals. To adjust the monitor, see "Monitor and Touch Screen" on page 3-8.

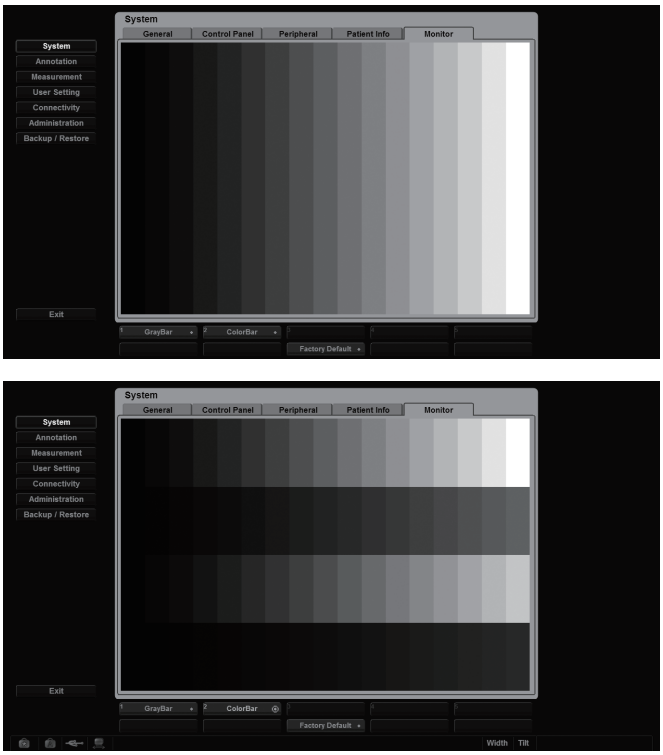


Figure 5-5 Gray & Color Bars

NOTE

After adjusting the monitor settings, you may need to verify the peripheral functions, such as standard printer and DVR.

Annotation

The **Annotation** preset allows you to specify body pattern/text options and to define body pattern/text libraries on the context menu. The following menus are available: General, Body Pattern, and Text.

The **Annotation** preset contains the following submenus:

- General
- Body Pattern
- Text

General

The **General** menu allows you to configure the text and body pattern options.

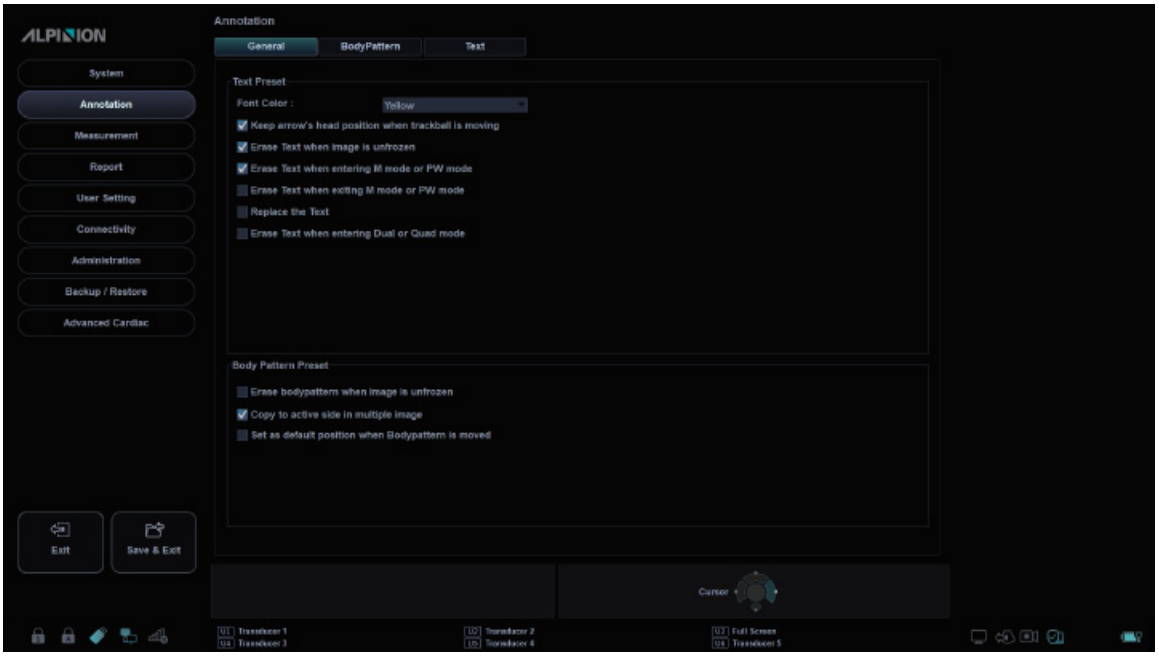


Figure 5-6 Annotation_General Display

Text Preset

- **Font Color**: Select a font color for comment.
- **Keep arrow's head position when trackball is moving**: Set to fix the direction of the pointer head when you move **[Trackball]**. When this option is not selected, the direction of the pointer head changes with the movement of **[Trackball]**.
- **Erase Text when image is unfrozen**: Set to erase all comments on the display when you press the **[Freeze]** key to return to scanning.
- **Erase Text when entering M mode or PW mode**: Set to erase all comments on the display when you enter M mode or PW mode.
- **Erase Text when exiting M mode or PW mode**: Set to erase all comments on the display when you enter M mode or PW mode.
- **Replace the Text**: Set to replace the comment with the new text.

- **Erase Text when entering Dual or Quad mode**: Set to erase all comments on the screen when the display is changed to the dual or quad layout screen.

Body Pattern Preset

- **Erase bodypattern when image is unfrozen**: Set to erase the body pattern on the display when you press the **[Freeze]** key to return to scanning.
- **Copy to active side in multiple image**: Set to copy the body pattern on the selected image in the dual or quad layout screen.
- **Set as default position when Bodypattern is moved**: Set to show the last position movement of the body pattern when you press the **Move Pattern** soft key.

BodyPattern

The **BodyPattern** menu allows you to define and change body pattern libraries. The left side of the Body Pattern menu shows all available body pattern libraries, and the right side shows the specific body patterns for the selected library. Once you have defined body patterns for a library, they are shown on the touch screen display of Body Pattern.

NOTE

To specify the default library per each preset, go to **User Setting** > **Annotation**.

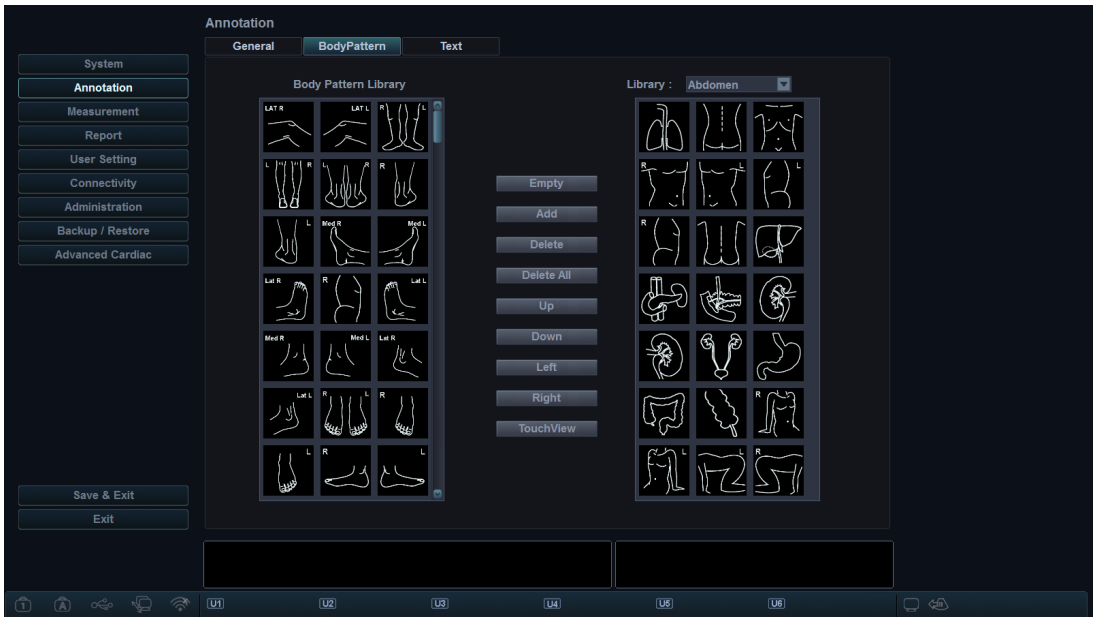


Figure 5-7 Body Pattern Libraries

To add a body pattern,

1. Select the library you want to add a body pattern from the library list.
2. Use **[Trackball]** to select a body pattern, and press the **[Set]** key twice or click **Add**.
   The body pattern is shown on the bottom of the library.
3. To change the position of the body pattern, select the body pattern and click **Up/Down/Left/Right**.
4. Click **Empty** to make an empty space on the touch screen.
5. Click **TouchView** to review the applied body marker on the touch screen.

6 Press the **Save** soft key and then click **Yes** to save the changes.

To delete a body pattern,

1 Select the library you want to delete a body pattern from the library list.
2 Use **[Trackball]** to select a body pattern, and press the **[Set]** key.
3 Click **Delete** to delete the body pattern.
4 Press the **Save** soft key and then click **Yes** to save the changes.

To change the location of a body pattern,

1 Select the library you want from the library list.
2 Use **[Trackball]** to select a body pattern, and press the **[Set]** key.
3 Click **Up**, **Down**, **Left**, or **Right** to change the location of the body pattern.
4 Press the **Save** soft key and then click **Yes** to save the changes.

Text

The **Text** menu allows you to change and define the text libraries. The left side of the Text menu shows all available text libraries, and the right side shows the specific text for the selected library. For each library, you can define up to one column with twenty three rows. The defined text is shown on the context menu of the text mode.

To add a text,

1 Select the library you want from the library list.
The system shows all texts saved in the library.
2 Use **[Trackball]** to select a text, and press the **[Set]** key.
The text is shown on the bottom of the library.
3 Click **Add** to add the selected text.
4 To change the text position, select the text and click **Up** or **Down**.
5 Click **Empty** to make an empty space on the touch screen.
6 Click **TouchView** to review the applied text on the touch screen.
7 Press the **Save** soft key and then click **Yes** to save the changes.

To create a new text,

1 On the ***New Text*** field, press the **[Set]** key.
2 Enter a new text and click **Add**.
The new text is shown on the bottom right of the library.

To delete a text,

1. Select the library you want from the library list.
2. Use **[Trackball]** to select a text and press the **[Set]** key.
3. Click **Delete** to delete the text.
4. Press the **Save** soft key and then click **Yes** to save the changes.

To change the text location,

1. Select the library you want from the library list.
2. Use **[Trackball]** to select a text and press the **[Set]** key.
3. Click **Up** or **Down** to change the text location.
4. Press the **Save** soft key and then click **Yes** to save the changes.

Measurement

The **Measurement** preset allows you to specify measurement and calculation preset.

The **Measurement** preset contains the following submenus:

- General
- Basic MEAS.
- Labeled MEAS.
- OB MEAS.
- Advanced MEAS.

General

The **General** menu allows you to define the cursor and result window settings.

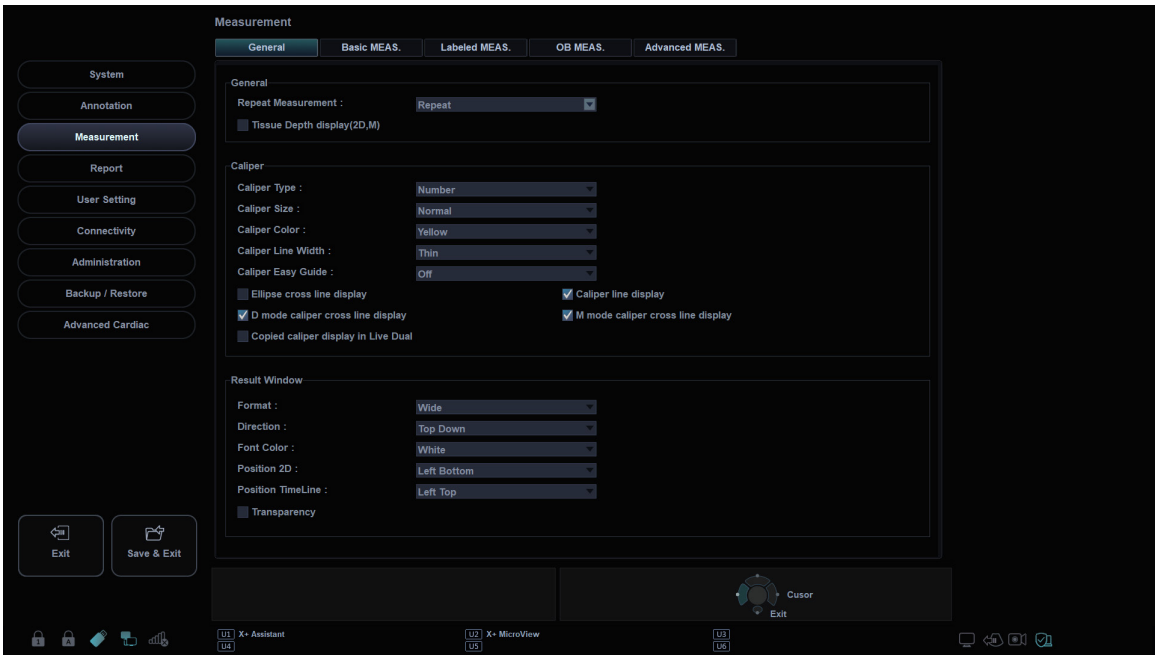


Figure 5-8 Measurement_General Display

General

- **Repeat Measurement**: Set to repeat the measurement.
  - **Repeat**: The selected measurement on the context menu is repeated.
  - **None**: The measurement is not repeated.
  - **Default Measurement**: The basic measurement is repeated (e.g. Distance).
- **Tissue Depth display(2D,M)**: Set to show the tissue depth (depth from the transducer surface) when moving the measurement cursor in 2D or M mode.

Caliper

- **Caliper Type**: Select a caliper type (Number or Symbol).
- **Caliper Size**: Select a caliper size (Normal or Large).
- **Caliper Color**: Select a color for the fixed measurement cursor.
- **Caliper Line Width**: Select a line width of the caliper (Thin, Normal, or Thick).
- **Caliper Easy Guide**: Select to activate Caliper Easy Guide while performing the measurement.
- **Ellipse cross line display**: Set to show the cross line for ellipse.
- **Caliper line display**: Set to show the caliper line when measurement is completed.
- **D mode caliper cross line display**: Set to show the cross line of the caliper in D mode.
- **M mode caliper cross line display:** Set to show the cross line of the caliper in M mode.
- **Copied caliper display in Live Dual**: Set to show the copied caliper in Live Dual mode.

Result Window

- **Format**: Select a window format (Wide or Narrow).
- **Direction**: Select a window direction (Top down or Bottom up).
- **Font Color**: Select a font color.
- **Position 2D**: Select a default position of the result window in 2D mode (Left Top, Left Bottom, Right Top, or Right Bottom).
- **Position TimeLine**: Select a default position of the result window in M and PW modes (Left Top, Left Bottom, Right Top, or Right Bottom).
- **Transparency**: Set to show the window background transparent or opaque.

Basic MEAS.

The **Basic MEAS.** menu shows all settings for the basic measurement in each application. Depending on the application, available settings may vary. You can define the basic measurement and default method for each basic measurement. You can control basic measurement by using the soft keys in each measurement mode.

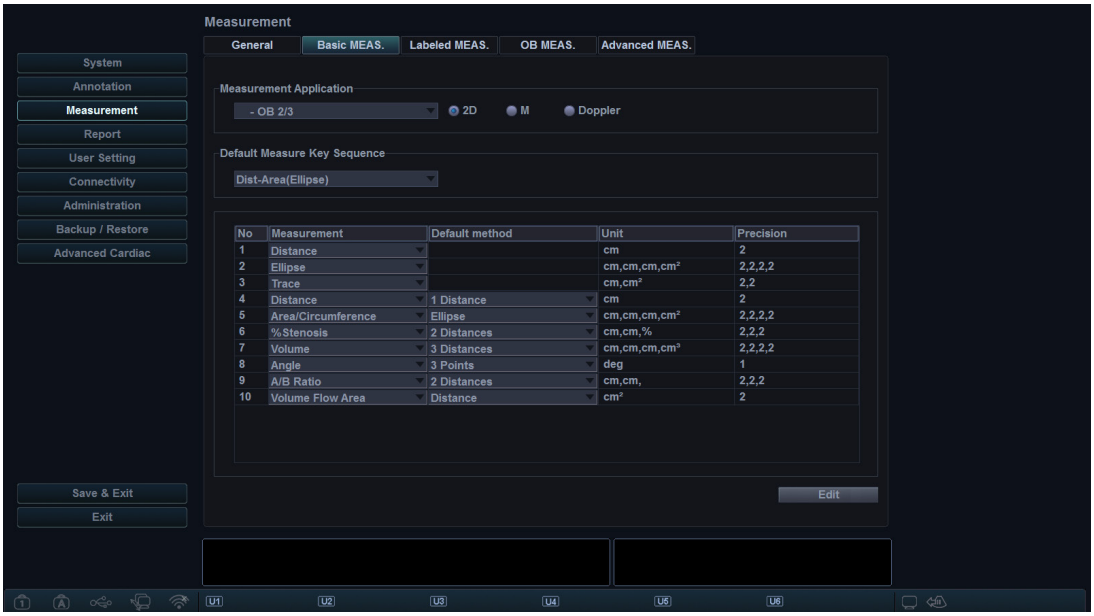


Figure 5-9 Basic Measurement Display

To start the basic measurement setup,

1. Select a measurement application.
2. Select a measurement mode (**2D**, **M**, or **Doppler**). The basic measurement entries of the selected measurement mode appear on the table.

   NOTE

   The order of the basic measurement is the same as on the soft key menu.
3. Specify **Default Measure Key Sequence**.
   For example) OB1, M mode: Select 2 Sequences (Distance, Time) or 3 Sequences (Distance, Time, Slope).
4. When you select **Distance**, **Time** for 2 Sequences, the distance caliper will be shown by pressing the **[Caliper]** key once. The time caliper will be shown by pressing the **[Caliper]** key twice.

Labeled MEAS.

The **Labeled MEAS.** menu shows all settings for the labeled measurement. You can control labeled measurement using the context menu in the measurement mode.

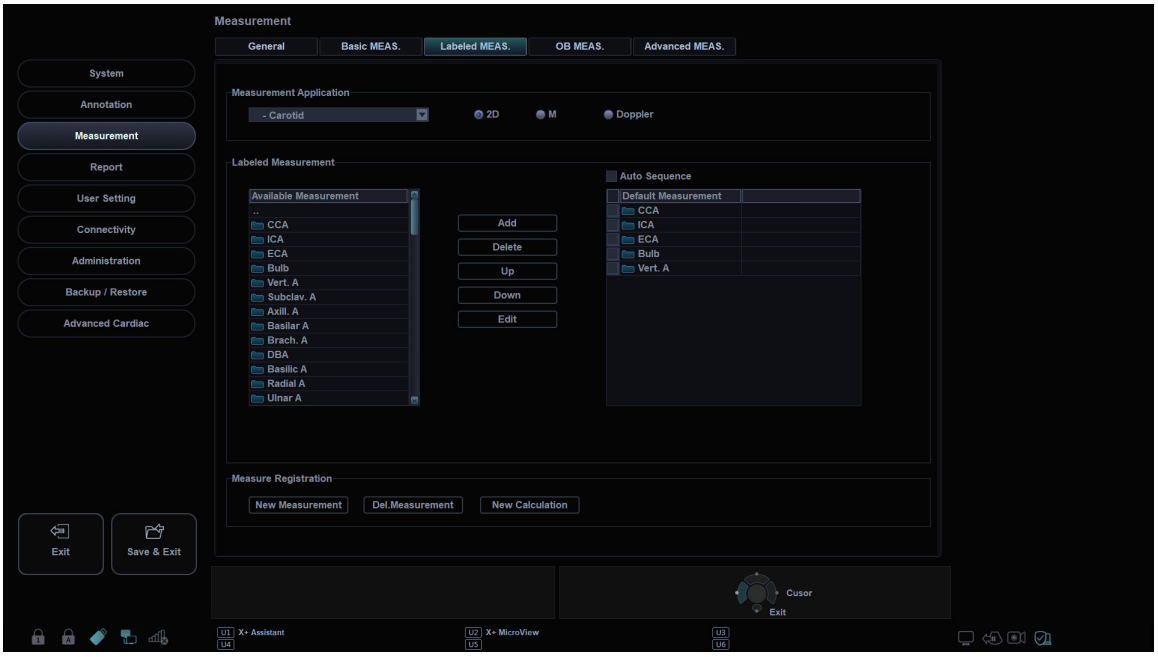


Figure 5-10 Labeled Measurement Display

To start the labeled measurement setup,

1. Select a measurement application from the drop-down list.
2. Select a measurement mode (**2D**, **M**, or **Doppler**).
3. All of the available measurement lists appears on the left of the measurement window. The default measurements are shown on the context menu.
4. To add a measurement to the context menu, select a measurement from the ***Available Measurement*** list and click **Add**.
5. To delete a measurement from the context menu, select a measurement from the ***Default Measurement*** list and click **Delete**.
6. To change the order of a measurement from the context menu, select a measurement from the ***Default Measurement*** list and click **Up** or **Down**.
7. To enable automatic sequence measurement, select **Auto Sequence**.

NOTE

You can change the author in the OB measurement.

Creating a new measurement

To create a new measurement entry,

1. Click **New Measurement**.
2. Specify the following measurement information.
   - **Measurement Name**: Enter a measurement name. Make sure that the measurement name is unique.
   - **Measurement Type**: Select a measurement type among Distance, Area, Angle, Volume, and Disk volume from the drop-down list.
   - **Caliper Type**: Select a caliper type from the drop-down list.
   - **Parameter**: Set to show Parameter, Parameter Type, Unit, Precision and Method. You can modify Unit, Precision and Method by changing them from the drop-down list.

   NOTE
   Depending on the measurement mode, available measurement types and caliper types may differ.
3. To save the settings, click **OK** and then **Yes**.
   You can see the new measurement in the ***Available Measurement*** list.

Creating a new parameter

To create a new parameter on a defined measurement,

1. Click **New Parameter**.
2. Specify the following parameter information.
   - **Parameter Name**: Enter a parameter name.
   - **Formula**: Enter a calculation formula and click **Check** to verify that the syntax is correct.
   - **Display Unit**: Select a display unit from the drop-down list.
   - **Display Precision**: Select a display precision from the drop-down list.

   NOTE
   When you input parameters, suitable unit should be considered for calculation.
3. To save the settings, click **OK** and then **Yes**.

Creating a new calculation

To create a new calculation,

1. Click **New Calculation**.
2. Specify the following calculation information.
   - **Calculation Name**: Enter a calculation name. Make sure that the calculation name is unique.
   - **Formula**: Enter a calculation formula and click **Check** to verify that the syntax is correct.
   - **Display Unit**: Select a display unit from the drop-down list.
   - **Display Group**: Select a display group from the drop-down list. The display group is shown on the ***Report*** page.
   - **Display Precision**: Select a display precision from the drop-down list.
   - **Measurement**: Select a measurement from the drop-down list.

   NOTE

   When you input parameters, suitable unit should be considered for calculation.
3. To save the settings, click **OK** and then **Yes**.

Editing a measurement

To edit a customized measurement,

1. Select a measurement from the list and click **Edit** or double-click the measurement.
   The ***Edit Measurement*** window appears on the screen.
2. Add or change the measurement by using **New Parameter** and **Edit Parameter**, and then change Unit, Precision and Method for report.
3. Click **OK** and then **Yes** to save your changes.

   NOTE

   The default measurements cannot be edited.

Editing a parameter

To edit the customized parameter,

1. Select a parameter from the list and click **Edit Parameter**.
   The ***Edit Parameter*** window appears on the screen.
2. Change the formula and output format such as Method, Unit, and Precision.
3. Click **OK** and then **Yes** to save your changes.

Editing a calculation

To edit a customized calculation,

1. Select a calculation from the list and click **Edit** or double-click the calculation.
   The ***Edit Calculation*** window appears on the screen.
2. Add or change the calculation by using **New Parameter** and **Edit Parameter**, and then change Unit, Precision and Method.
3. Click **OK** and then **Yes** to save your changes.

Deleting a measurement

To delete a measurement entry,

1. Select a customized measurement from the ***Available Measurement*** list.
2. Click **Del.Measurement**.

Deleting a parameter

To delete a customized parameter,

1. Select a parameter from the list.
2. Click **Delete Parameter**.

Deleting a calculation

To delete a customized calculation,

1. Select a customized calculation from the ***Available Measurement*** list.
2. Click **Del.Measurement**.

NOTE

The default calculations cannot be edited or deleted.

Setting up the automatic sequence for EFW

The automatic sequence feature allows you to perform EFW measurements in sequence.

1. Go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.**.
2. Select an OB application from the ***Available Measurement*** list.
3. Select an EFW folder and click **Add**.
4. Double-click the selected measurement.
5. Select the **Auto Sequence** check box on the top of the ***Default Measurement*** list.

Creating new biometry measurement

To see the different authors' measurement based on same biometry,

1. Go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.**.
2. Select a biometry measurement from the ***Available Measurement*** list.
3. Click **Copy Biometry**.
   You can see the copied measurement item in the ***Default Measurement*** list.
4. To save the changes, click **Save**.

OB MEAS.

The **OB MEAS.** menu allows you to define default OB presets such as OB type and OB graph. You can also register a user-defined OB table.

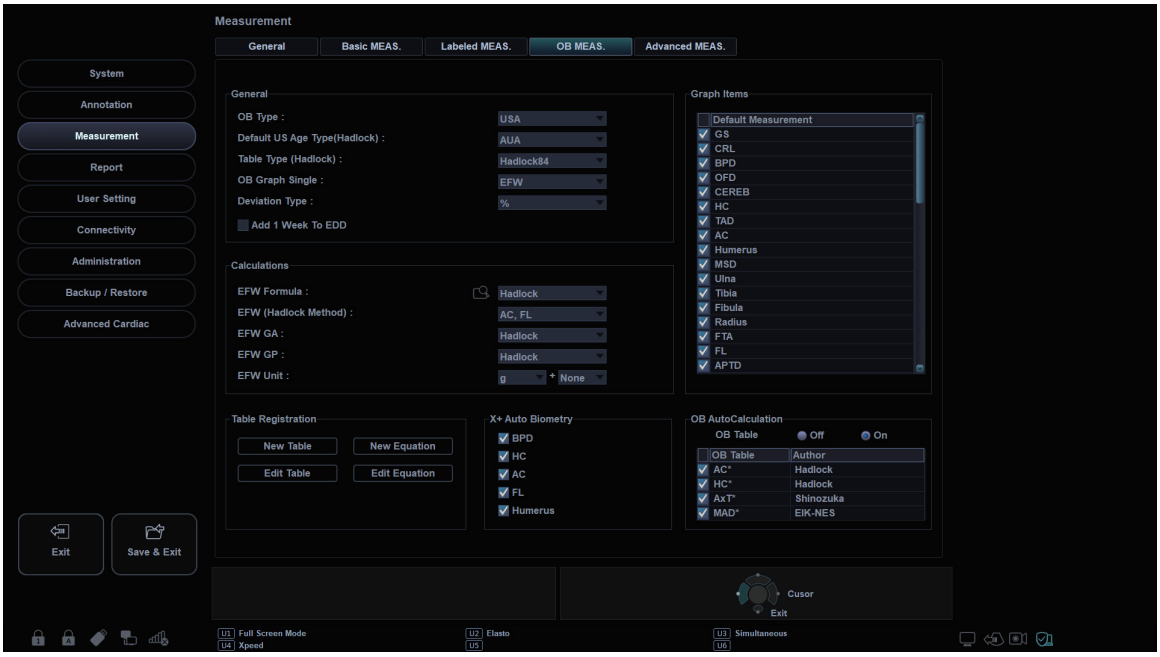


Figure 5-11 OB Measurement Display

General

- **OB Type**: Select an OB type (USA, Europe, Tokyo, Osaka or ASUM) from the drop-down list for the measurement and calculation. The default measurement list may differ depending on the selected OB type.
- **Default US Age Type(Hadlock)**: Select CUA (Composite Ultrasound Age) or AUA (Average Ultrasound Age).
- **Table Type (Hadlock)**: Select Hadlock82 or Hadlock84 for OB table.
- **OB Graph Single**: Select EFW or Last for displaying OB graph as default.
- **Add 1 Week to EDD**: Set to add additional week to estimate the date of delivery.
- **Deviation Type**: Select Growth Percentile(%) or Standard Devaition(SD).

Calculations

- **EFW GP**: Select an author name to calculate EFW GP (Estimated Fetal Weight Growth Percentile).
- **EFW Formula**: Select Hadlock, Campbell, Hansmann, Merz, Osaka, Persson, Schild, Shepard, Shinosuka1, Shinosuka2, Shinosuka3, or Tokyo.
- **EFW (Hadlock Method)**: Select (HC, AC), (AC, FL), (AC, BPD), (AC, BPD, FL), (AC, FL, HC), or (AC, BPD, FL, HC).
- **EFW Unit**: Change the measurement unit for EFW.
- **EFW GA**: Select Table/Formula for calculating the gestational age from the EFW.

Table Registration_Creating a new OB table

To create a new OB table,

1. Click **New Table**.
2. Enter an author name.

   NOTE

   Author name always should be unique.

3. Select options in the ***Biometry*** and ***Ref. Author*** fields.
4. Select **Fetal Age** or **Fetal Growth**.
5. When you selected **Biometry** and **Ref. Author**, the pre-defined values are shown on the table, and you can edit the table value. When you selected **None** from **Ref. Author**, the table will be reset.
6. Select **SD Format** for a deviation type.
7. Select **Input Unit** for input and **Output Unit** for output.
8. Enter **Min**, **Max**, and **Interval** for range. The system creates default values on the table automatically. For the other options, you can manually enter or edit the values.
9. To enter the value, move the cursor to the desired field and press the **[Tab]** key.
   - To move the row, click → or →. You can also press the **[Enter]** key to move to the next row.
   - To move to the column, click ↑ or ↓.
10. To add additional line, click **Insert**.
11. To delete a line, click **Delete**.
12. To clear all values, click **Clear All**.
13. When you have finished, click **OK** and then **Yes** to save your changes.

NOTE

You can import an OB table template as an Excel file which is created by PC.

Table Registration_Editing an OB table

To edit an OB table,

Once you have created your own table, you can edit the table by clicking **Edit Table**. You can only edit the table values, not the table type. The editing table procedure is the same as **New Table**.

NOTE

The default tables and equations cannot be edited.

Table Registration_Creating new OB equation

To create new equation,

1. Click **New Equation**.
2. Enter an author name.

   NOTE

   Author name should always be unique.

3. Select an option in the ***Biometry*** field.
4. Select **Fetal Age** or **Fetal Growth** for equation type.
5. To make a formula, select formula components from the ***Inputs*** and ***Operators*** fields, and enter a formula in the formula field.
6. Click **Check** to test the formula. If there are no errors, the "Syntax OK!" appears. If any error occurs on the formula, an error message appears in the formula field.
7. Specify the input range for the ***Min*** and ***Max*** fields.
8. Click **OK** and then **Yes** to save your changes.

Table Registration_Editing OB equation

Once you have created your own equation, you can edit the equation by selecting **Edit Equation**. The editing equation procedure is the same as **New Equation**.

Available operators for equation

The following table shows available operators for using equation.

Table 5-2 Equation operator

Operator	Definition
+	Addition
-	Subtraction
*	Multiplication
/	Division
( )	Parenthesis
^	Caret
sqrt	Square root
pi	Pi
log	Logarithm
ln	Natural logarithm
exp	Exponential
abs	Absolute value

OB AutoCalculation: Set to perform the automatic OB calculation. Select the **OB Table** check box to select the OB calculations (AC*, HC*, AxT*, MAD*).

X+ Auto Biometry

Set to perform the automatic fetal biometry calculation. Select the fetal biometry calculations (BPD, HC, AC, FL, Humerus).

Advanced MEAS.

The **Advanced MEAS.** menu allows you to define application parameters, especially the Doppler measurement.

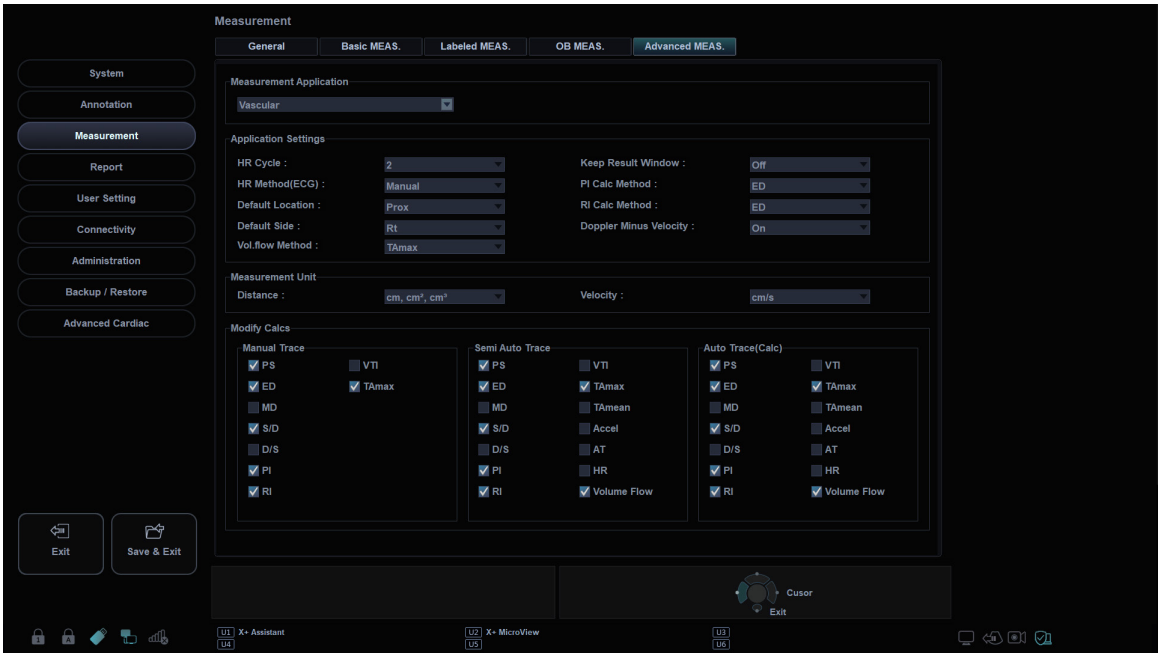


Figure 5-12 Advanced Measurement Display

Measurement Application

Select an application to be defined.

Application Settings

- **HR Cycle**: Select a heart rate cycle (1-10).
- **HR Method(ECG)**: Select HR Method (Manual or Automatic).
- **Default Location**: Select a default location for the selected application (Off, Prox, Mid, or Dist).
- **Default Side**: Select a default side (Left or Right).
- **Keep Result Window**: Set to show the previous results of the measurements you performed on the ***Result*** window (Auto/On/Off). If you select **Auto**, the previous result for volume measurement is shown on the ***Result*** window. If you select **On**, the previous result for labelled measurement is shown on the ***Result*** window.
- **PI Calc Method**: Select a parameter (ED or MD) to calculate PI (Pulsatility Index).
- **RI Calc Method**: Select a parameter (ED or MD) to calculate RI (Resistivity Index).
- **Vol.flow Method**: Select a parameter (TAmax or TAmean) to calculate Volume Flow.

Measurement Unit

- **Distance**: Configure the unit of measurement for all distances at one time (cm, cm², cm³ or mm, mm², mm³).
- **Velocity**: Configure the unit of measurement for all velocities at one time (cm/s, m/s, or mm/s).

Modify Calcs

- **Manual Trace**: Select the measurements to perform the manual calculation for the selected application.
- **Auto Trace(Calc):** Select the measurements to perform the automatic calculation for the selected application.
- **Semi Auto Trace**: Select the measurements to perform the semiautomatic calculation for the selected application.

NOTE

To set up the Auto trace direction, Auto trace method, and Auto trace sensitivity, go to **ImagePreset** > **General**.

Report

The **Report** preset allows you to specify report and report print preset.

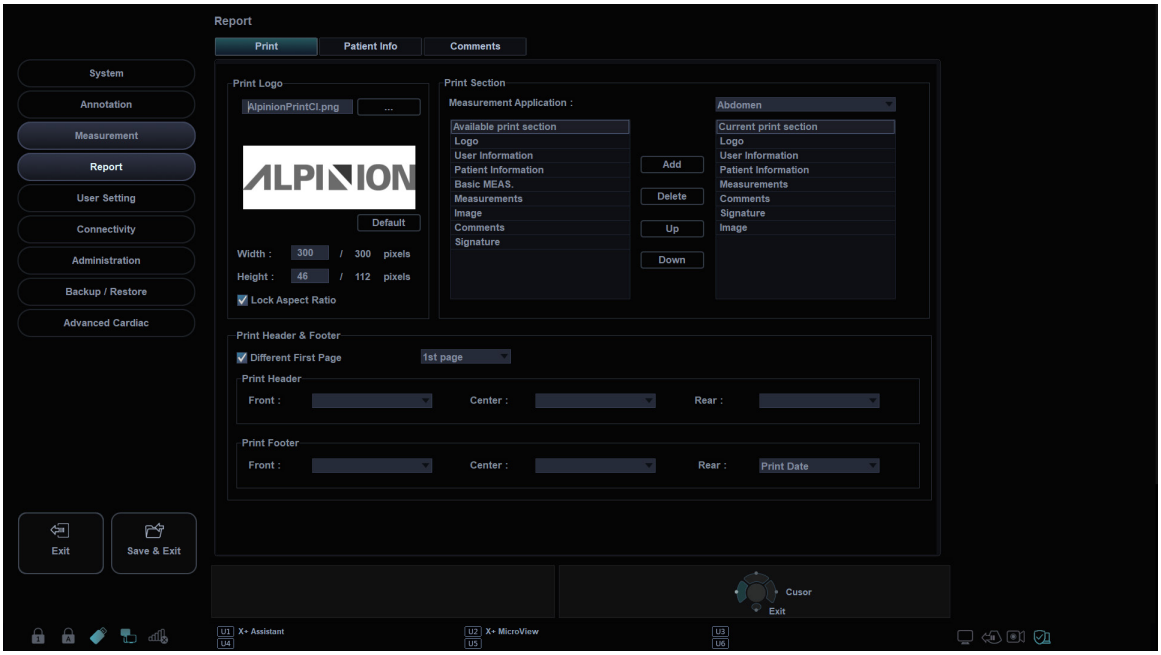


Figure 5-13 Report Display

Print

Print Logo

Change the logo image when you print the report.

Print Section

Set the print section for each application.

Print Header & Footer

Set the options for print header and footer.

– Select the **Different First Page** check box to set the header and footer for the first page differently.

Patient Info

Patient Info Section

Customize the Patient Information section for each application.

Preview Section

Preview the Patient Information section.

Comments

Comments

- **Use Default Template on Cardiac Exam**: Select to use default cardiac comments template.

Report Order

The **Report Order** menu allows you to edit the application-specific measurements displayed on the report.

User Setting

The **User Setting** preset allows you to configure application specific setting and to configure programmable keys such as P1, P2, P3, P4, user-defined keys, and hot key.

The **User Setting** preset contains the following submenus:

- Annotation
- Measurement
- User Defined key
- Print/Foot Switch

Annotation

The **Annotation** menu allows you to specify the default body pattern library to be shown in the **Body Pattern** menu. You can also specify the default text library to be shown when you use comments.

Measurement

The **Measurement** menu allows you to specify the default package measurement to be shown when you use the measurement.

User Defined key

The **User Defined key** menu allows you to specify user-defined keys. To assign functions onto numeric keys (0-9), select the **Enable Hot Key** check box and assign a key function. The following table shows the functions that you can assign for available keys.

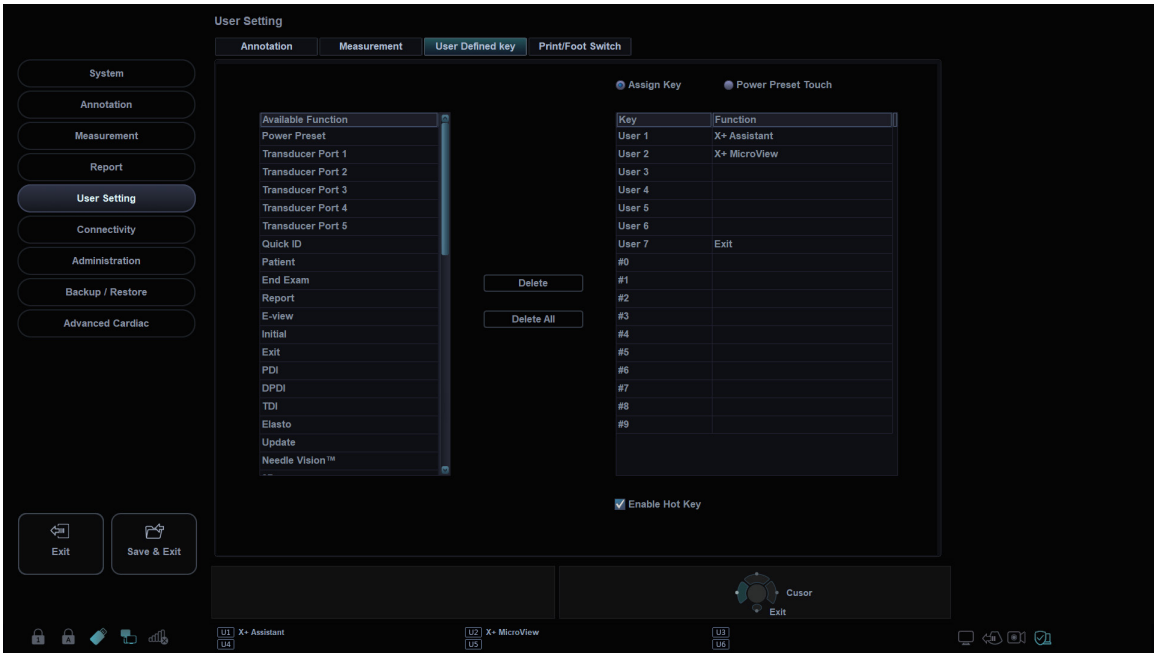


Figure 5-14 User Setting_User Defined Key Display

Table 5-3 User-defined key

Key / Function Key	User key (1–7)	Numeric key (0–9)
Power Preset	O	O
Transducer Port 1	O	O
Transducer Port 2	O	O
Transducer Port 3	O	O
Transducer Port 4	O	O
Transducer Port 5	O	O
Quick ID	O	O
Patient	O	O
End Exam	O	O
Report	O	O
E-view	O	O
Initial	O	O
Exit	O	O
PDI	O	O
DPDI	O	O
TDI	O	O
Elasto	O	O
Update	O	O
Needle Vision™	O	O
3D	O	O
4D	O	O
STIC	O	O
Panoramic	O	O
StressEcho	O	O
Cube Strain™	O	O
Full Screen	O	O
X+ MicroView	O	O
CEUS	O	O
pSWE	O	O
Arrow	O	O

Key / Function Key	User key (1–7)	Numeric key (0–9)
Clear All	O	O
Virtual	O	O
L/R Flip	O	O
U/D Flip	O	O
Quick Angle	O	O
Auto Calc	O	O
Simultaneous	O	O
Full D	O	O
Full M	O	O
Biopsy	O	O
DVR	O	O
Rec/Pause	O	O
Eject	O	O
Cube View™	O	O
X+ Assistant	O	O
Xpeed	O	O
Tilt	O	O

Assign Key

To configure the User keys or numeric keyboard keys,

1. Select the function from the ***Available Function*** list.
2. Select the corresponding User key (**User 1-7**) or a numeric key (**#0-9**) from the ***Key*** list.
3. The selected function is shown in the ***Function*** list.

Power Preset Touch

Power Preset 1-5 on the touch screen allow you to quickly change the transducer and its preset.

To configure the Power Preset,

1. Select a Power Preset (**Power Preset1-5**) from the ***Key*** list.
   The dialog box for transducer and application selection appears.
2. Select the desired transducer, application and preset on the touch screen.
3. Click **OK** to complete the selection.
4. The selected transducer, application and preset are shown in the corresponding ***Function*** list.

Print/Foot Switch

The **Print/Foot Switch** menu allows you to define the optional footswitch and the print keys.

To assign print keys,

1. Select a print key (**P1**, **P2**, **P3**, **P4**) on the upper side of the display.
2. Select the device you want to add under the device category on the left side of the display.
3. Click **>>** on the middle of the display.
4. To configure the multiple devices to the each print key, select devices as many as you want from the corresponding device categories.

Print key functions

You can set the print keys to perform the following functions.

- **Image Type**: Set the print key to save an image to the clipboard. When you press the **[P1]** key (or the assigned print key), the current image is moved to the clipboard. The image format depends on the saving option and current status (live or frozen).

Table 5-4 Store format option

Option	Description
Image Type	Select a saving area (Single, Cine, Screen capture(Whole), Screen capture(Diagnostic)).

- **Print**: Select the printer from the ***Available Printer*** list.
- **Standard Print**: Set the print key to print the image via the standard printer. You can also print an image via other printers.

Table 5-5 Print option

Option	Description
Printer Direction	Select a printing direction (Landscape or Portrait).
Printer Area	Select a printing area (Whole Screen, Diagnostic, or Full Diagnostic).
Printer Quality	Select a printing quality (Default, Low, Medium, or High).
Printer Paper	Select a printer paper.
Enable Video Invert	Set to print an image or the background in black.
Hide image parameter when image printed	Set to print an image with the image parameter hidden.

- **3D/4D**: Set the print key to export the complete volume data in volume file format. The stored volume data can be reviewed with the PC program.
- **Network Storage & Media**: Set the print key to send an image to network storage, USB flash drive, USB hard disk. To configure the network storage setting, go to **SystemPreset** > **Connectivity** > **General** > **Network Storage**.
- **DICOM Server**: Set the print key to send an image to a DICOM device. To configure the DICOM settings, go to **SystemPreset** > **Connectivity** > **Storage** or **Print**.

Footswitch functions

To assign functions for the each pedal of the footswitch, select a function from the corresponding list (**Right**, **Center**, **Left**). The following functions are available:

• Freeze	• M Mode
• P1	• PW Mode
• P2	• Update
• P3	• Simultaneous
• P4	• Measure
• Dual	• End Exam
• Quad	• Rec/Pause
• CF Mode	• Transducer Port 1–5
• PD Mode	• DPDI

Connectivity

The **Connectivity** preset allows you to configure the network connection and DICOM protocols. DICOM is an abbreviation of Digital Imaging and Communications in Medicine. This is a standard protocol for handling, storing, printing, and transmitting information in medical imaging. Using the DICOM option, you can send or print images after connecting the system and PACS.

NOTE

- DICOM is an optional service. To use this service, you need DICOM installation.
- To enter the connectivity screen, you must log in as an administrator.

The **Connectivity** preset contains the following submenus:

- General/Network Storage/CubeView™/CubeNote
- Network
- Storage
- Print
- Worklist
- MPPS
- DICOM Q&R

General

The **General** menu allows you to configure the general network connection settings such as computer name, AE title, and port number.

NOTE

To set up Internet Protocol, contact your hospital's network administrator.

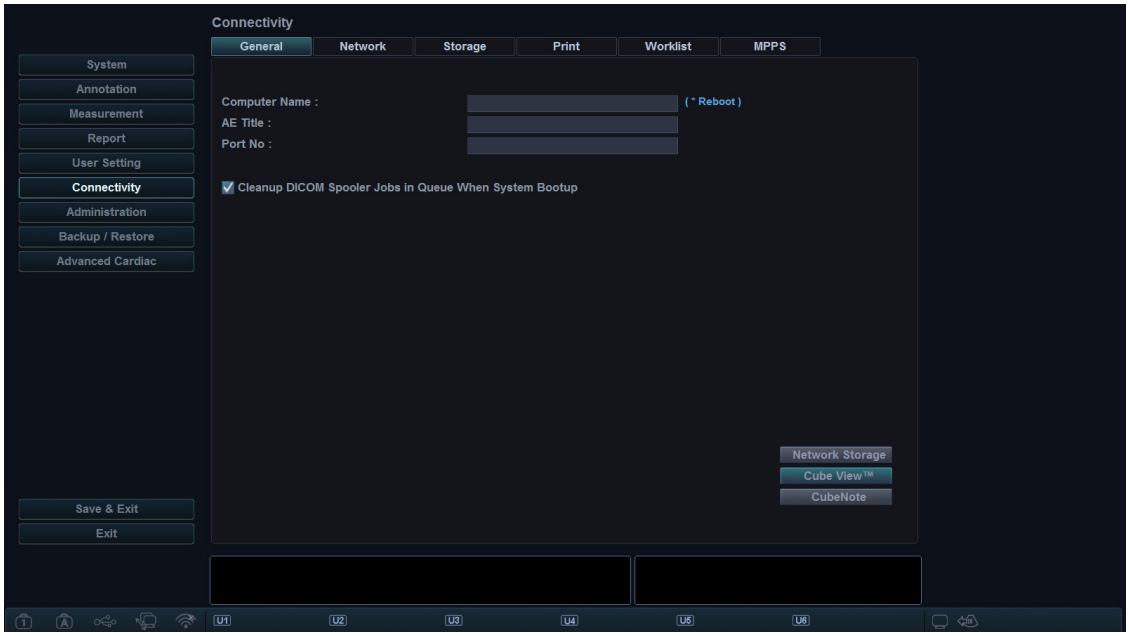


Figure 5-15 Connectivity_General Display

To configure the general network connection settings,

1. Enter a computer name in the ***Computer Name*** field.
2. Enter an Application Entity (AE) title in the ***AE Title*** field.
3. Enter a port number of your system in the ***Port No*** field.
   - **Cleanup DICOM Spooler jobs in Queue when System Bootup**: Set to delete all DICOM jobs in queue when system reboots.
4. Press the **Save** soft key and then click **Yes** to save the changes.
5. Reboot your system.

Network Storage

The **Network Storage** menu allows you to customize options for sending backup data to Shared directory. You can add and edit a network storage device.

To enter the **Network Storage** menu,

– Go to **General** menu and click **Network Storage** on the bottom right of the display.

To add a network storage device,

1. Click **New**.
2. Enter a name of the network storage device in the ***Destination Name*** field.
3. Enter a shared directory path for the device in the ***Shared Dir*** field.
4. Enter an ID of the device in the ***ID*** field.
5. Enter a password of the device in the ***Password*** field.
6. Select a device that is connected to the intra network driver.
7. Click **Verify** to verify the network connection.

To delete a network storage device,

1. Select the destination name that you want to delete.
2. Click **Remove**.
3. Press the **Save** soft key.

Properties

- **Type**: Select an image format to save images to network storage (JPEG, BMP).
- **2D Cine**: Save 2D cine images as WMV format.
- **4D Volume Cine(*AVI)**: Save 4D volume images as AVI format.

Cube View™

The **Cube View™** menu allows you to set up the network options for accessing to the Cube View Control Server. You can add and edit a Cube View Control server device.

To enter the **Cube View™** menu,

– Go to **General** menu and click **Cube View™** on the bottom right of the display.

To add a Control Server device,

1. Click **New**.
2. Enter a name of the Cube View Control Server device in the ***Destination Name*** field.
3. Enter an IP address of the Cube View Control Server device in the ***IP Address*** field.
4. Enter a Port number of the Cube View Control Server device in the ***Port No*** field.
5. Enter an access ID of Cube View Client in the ***ID*** filed.
6. Enter a password of Cube View Client in the ***Password*** field.
7. Click **Verify** to verify the Cube View Control Server connection.

To delete a Cube View Control Server device,

1. Select the destination name that you want to delete.
2. Click **Remove**.
3. Press the **Save** soft key.

Properties

- **Compression**: Select an image compression type. (Lossy, Lossless)
- **Quality**: If you selected **LOSSY** in the ***Compression*** field, select compressibility.
- **Enable Adjust Quality**: Set whether to adjust a compression type and an image quality.

CubeNote

The **CubeNote** menu allows you to set up the network options for accessing to the CubeNote Control Server. You can add and edit a CubeNote Control server device.

To enter the **CubeNote** menu,

– Go to **General** menu and click **CubeNote** on the bottom right of the display.

To add a Control Server device,

1. Enter a hospital code in the ***Hospital Code*** field.
2. Enter a name of the CubeNote Control Server device in the ***Destination Name*** field.
3. Enter an access ID of CubeNote Client in the ***ID*** filed.
4. Enter a password of CubeNote Client in the ***Password*** field.
5. Click **Verify** to verify the CubeNote Control Server connection.

Network

The **Network** menu allows you to set up Internet protocol. You need a separate IP address for your system.

NOTE

To set up Internet Protocol, contact your hospital's network administrator.

Local Area

Specify the following IP address settings:

- **DHCP**: Select the DHCP option for a dynamic IP address.
- **Use Following IP Address**: Select this option to use a static IP address.
  - **IP Address**: Enter an IP address.
  - **Subnet Mask**: Enter the subnet mask.
  - **Default Gateway**: Enter the default gateway address.
  - **Preferred DNS Server**: Enter the preferred DNS server.
  - **Alternate DNS Server**: Enter the alternate DNS server.
  - **Network Speed**: Select the network speed.

Wireless

To connect to the wireless network,

1. Specify the IP address settings.

   NOTE

   The IP address settings are the same as the ones in Local Area menu.

2. Select the desired SSID from the ***Wireless search*** list.

   NOTE

   The name of the connected wireless network must be English alphabet letters.

3. Click **Connect**.
4. Enter a password and click **OK**.

You can see the connection status of wireless network by checking the icon in the status bar.

Table 5-6 Wireless Network connection status

Icon	Description
	Disconnected to the USB Wireless module.
	Connected to the USB Wireless module but disconnected to the wireless network.
	Successfully connected to the wireless network.

DICOM (Digital Imaging and Communications in Medicine)

DICOM is the abbreviation of Digital Imaging and Communications in Medicine. This is the industrial standard for communication of images and other information between medical devices on the network. Using the DICOM option, you can send or print images after connecting your ultrasound equipment and PACS.

Common DICOM service parameters

There are certain parameters that may need to be set up for each DICOM service. The parameters are described on the following DICOM services.

NOTE

- DICOM is an optional service. To use this service, you need DICOM installation.
- To enter the connectivity screen, you must log in as an administrator.

- DICOM Storage
- DICOM Storage Commitment
- DICOM Print
- DICOM Worklist
- DICOM MPPS
- DICOM Q&R

Setting

- **Name**: Enter a description for each service.
- **AE Title**: Enter the Application Entity (AE) title of this service.
- **Port No**: Enter a port number of the service.
- **Retry**: Enter a maximum number of times to try when the system fails to connect to a destination device.
- **Retry Interval(s)**: Set the time interval of retry.
- **Timeout(s)**: Set the period of timeout when the retry connection is over.
- **Move AE Title**: Enter the Application Entity (AE) title of this service.

  NOTE

  This parameter is only available for DICOM Q&R. If necessary, ask your PACS vendor for this information.

- **Move Port No**: Enter a port number of this service.

  NOTE

  This parameter is only available for DICOM Q&R. If necessary, ask your PACS vendor for this information.

Verify

1. Select a destination.
2. Click **Verify** to start verification. When the verification is completed, the one of the following icons is shown.

Table 5-7 DICOM verification

Icon	Description
	Successfully connected
	Failed in connection
	In progress

View

View allows you to view the connectivity architecture of your system such as configured DICOM service and network structured tree.

Storage

DICOM Storage enables the system to send or receive ultrasound images in a format that can be interpreted by PACS.

The **Storage** menu allows you to set up a DICOM Storage service.

To add a DICOM storage device,

1. Click **New**.
2. Enter a name of the DICOM storage device in the ***Destination Name*** field.
3. Enter a device's IP address in the ***IP Address*** field.
4. Enter the Application Entity (AE) title for a device in the ***AE Title*** field.
5. Enter a port number in the ***Port No*** field.
6. Click **Verify** to confirm the connection.
7. Click **OK**.

To remove a DICOM storage device,

1. Select the destination name that you want to remove.
2. Click **Remove**.
3. Click **Yes** to confirm.

Properties

- **Enable Structure Report:** Set to send a report with images.
- **Enable Raw data of Compact 3D/4D (Image Arena™)**: Set to send a 3D/4D image with raw data for Image Arena™.
- **Enable Multiframe**: Set to save multi-frame cine images in the DICOM storage.
- **Compression**: Select a default compression type.
- **Quality**: Select a default image quality.
- **Monochrome**: Set to send images in monochrome. If you select **Monochrome or Color**, you will be asked every time to determine sending images in monochrome or color.
- **Commitment**: Set to receive notification from PACS when a study has been transferred successfully. When this option is enabled, you can specify the following information:
  - **Properties**: Select an associated storage.
  - **Accepter**: Specify the accepter's settings such as AE title, port number, and timeout.

Print

DICOM Print provides the ability to send or receive ultrasound image data to DICOM printers.

The **Print** menu allows you to set up a DICOM Print service.

Properties

- **Format**: Select a printing format that determines the number of images to be printed out in one page.
- **Priority**: Select the printing job priority (HIGH, MED, or LOW).
- **Medium**: Select a printing medium (CLEAR FILM, PAPER, or BLUE FILM).
- **Copies**: Select the number of copies.
- **Orientation**: Select a printing direction (LANDSCAPE or PORTRAIT).
- **Film Size**: Select the dimensions of the film size (81NX101N or 101NX121N).
- **Film Destination**: Select the film destination (MAGAZINE or PROCESSOR).
- **Magnification**: Select how the print magnifies the image to fit it onto the film.
  - **REPLICATE**: Interpolate pixels are copied of adjacent pixels.
  - **BILINEAR**: Interpolate pixels are created by bilinear interpolations between the adjacent pixels.
  - **CUBIC**: Interpolate pixels are created by cubic interpolations between the adjacent pixels.
  - **NONE**: No interpolation
- **Trim**: Set to show the trim box around images on the film (YES or NO).
- **Empty Image**: Set how to show empty images (BLACK or WHITE).
- **Color**: Select a color type (COLOR or GRAY).
- **Min Density**: Enter the minimum density level of the film.
- **Max Density**: Enter the maximum density level of the film.
- **Config. information**: Enter a name of the specified image quality setting.
- **Film Session Label**: Enter an organization name to be shown on the film label.
- **Smoothing Type**: Select the printer's magnification interpolation for the output.
- **Border**: Select a border area between the images of the film (BLACK or WHITE).

Worklist

DICOM Worklist provides a list of patients sorted by query parameters.

The **Worklist** menu allows you to set up a DICOM Worklist service.

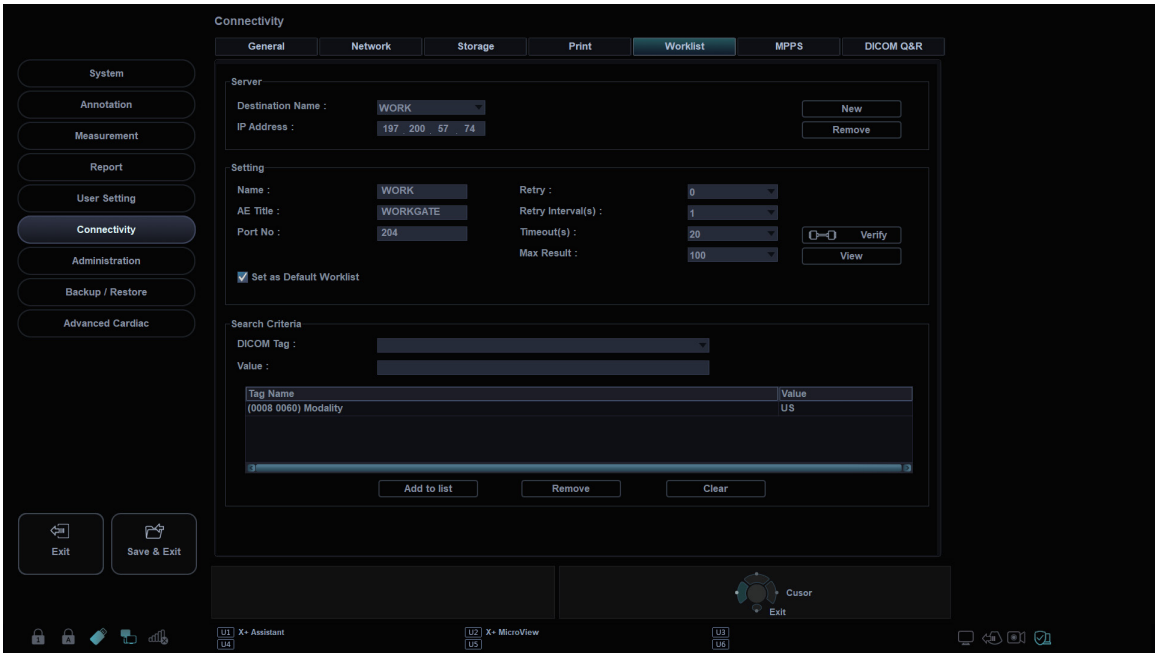


Figure 5-16 Connectivity_Worklist Display

To add a worklist,

1. Click **New**.
2. Enter a name of the DICOM storage device in the ***Destination Name*** field.
3. Enter a device's IP address in the ***IP Address*** field.
4. Enter the Application Entity (AE) title for a device in the ***AE Title*** field.
5. Enter a port number in the ***Port No*** field.
6. Click **Verify** to confirm the connection.
7. Click **OK**.

To remove a worklist,

1. Select the destination name that you want to remove.
2. Click **Remove**.
3. Click **Yes** to confirm.

Search Criteria

- **DICOM Tag**: Select information type that you want to define for search parameters such as Modality and Referring Physician's name.
- **Value**: Enter the value of the selected tag item.
- **Add to list**: Add tag and value to the list of search criteria.
- **Remove**: Remove tag and value to the list of search criteria.
- **Clear**: Clear all tags from the list.

MPPS (Modality Performed Procedure Step)

DICOM MPPS provides the ability to send images to a DICOM server with transfer information.

The **MPPS** menu allows you to set up a DICOM MPPS service.

DICOM Q&R (DICOM Query/Retrieve)

DICOM Query/Retrieve provides a list of patients sorted by query parameters.

The **DICOM Q&R** menu allows you to set up a DICOM Query/Retrieve service.

Backup / Restore

The **Backup / Restore** preset allows you to back up and restore the user data. You may lose user settings or patient information files such as patient's basic information and scanned images because of physical shocks to the product or internal errors. Therefore, you should back up user settings and patient information data on a regular basis.

You can select a storage media (CD, DVD, USB flash drive, USB hard disk, and network storage) to perform the backup.

NOTE

To save images permanently, avoid using the local hard disk. Regularly back up the image archive to a storage media.

CAUTION

Follow the suggested backup procedure in the manual. ALPINION MEDICAL SYSTEMS does not have the responsibility for data loss caused by the user's carelessness.

The **Backup / Restore** preset contains the following submenus:

- User Backup
- Image Backup
- Full Backup

User Backup

The **User Backup** menu allows you to back up the each preset data. You can use a CD, DVD, USB flash drive and Local Archive for user preset backup.

To select all user-defined presets, select the **User Defined Configuration** check box.

- **Image Preset**: Set to back up or restore the Image preset only.
- **Service**: Set to back up or restore the Service preset only.
- **Measurement**: Set to back up or restore the Measurement preset only.
- **Annotation**: Set to back up or restore the Text and Body Pattern preset only.
- **Connectivity**: Set to back up or restore the Connectivity preset only.
- **Report**: Set to back up or restore the Report only.
- **Others**: Set to back up or restore other presets such as System and User settings.

To back up the user preset data,

1. Insert a blank media properly on your system.
2. Select a media from the ***Media*** drop-down list.
3. If you select **USB** from the ***Device*** drop-down list, enter the description in the ***Description*** field.
4. Select the user preset you want to back up.
5. Click **Backup** to start backup. The backup procedure begins.
6. After the backup is completed, the last backup time and date appear next to the preset category.

To restore the user preset data,

NOTE

Make sure that the software version of the data is the same as the system's software version. If NOT, you may not perform the restoration.

1 Insert a media on your system.

2 Select the user preset(s) you want to restore.
If your media is USB flash drive, select the user preset(s) you want to restore from the backup list.

3 Click **Restore** to start restoring. The restore procedure begins.

Image Backup

The **Image Backup** menu allows you to perform image backup using a storage media. Select your memory storage such as CD, DVD, USB flash drive, USB hard disk, and network storage.

CAUTION

- While restoring Image Archive data, some existing database may be overwritten on the local hard disk and you may not be able to restore the old data. Make sure that you use the appropriate media before the restoration proceeds.
- Before restoring Image Archive, make sure that the software version is the same or compatible with the current system. The system may not proceed restoring if the version is different.
- Do NOT turn the system off while backup is in progress. You may lose your image data.

NOTE

Use **Restore** on **E-View** to restore image data.

Media

- **Media**: Select your default storage media. Available media are CD, DVD, USB flash drive, USB hard disk, and network storage.
- **Media Capacity**: Select the media capacity. The system calculates the number of backup CDs that you need before performing the backup and informs you.

Image Archive Option

- **Backup period**: Specify the starting and ending date to back up patient data for a certain period.
- **Image Move after Backup**: Set to remove the backup image file after backup is completed.
- **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.
- **Finalization of CD/DVD**: Set to finalize a CD or DVD after backup is completed.
- **Skip the data that has already backed up**: Set to skip the data backup if the data has already been backed up.

NOTE

DICOMDIR is a DICOM file format which provides index and summary information for all the DICOM files on media. If you want to save studies to CD or DVD and view them on the PACS system, you should select this option.

To back up Image Archive,

1. Configure Media.
2. Configure Image Archive Option.
3. Prepare unformatted CD(s).
4. Click **Backup** to start backup Image archive.
   The media formatting starts and the instructional message appears.

You can view and import backup media via **E-View** menu.

To view the backup images,

1. Insert your media.
2. Go to **E-View**.
3. Change the source to your media from the local hard disk.
4. View the backup images of the study you want.

Full Backup

NOTE

The USB hard disk drive is only available for the full preset backup.

This full preset backup is for service purpose only. You can back up the system data such as user preset, image archive, and service configuration.

Administration

The **Administration** preset contains the following submenus:

- Service
- Users
- Options
- System Info
- Patient Data

Service

To activate the service browser, click **Service Station**. The Windows login screen appears.
For more information, see the ***Service Manual***.

Users

The **Users** menu allows you to define the user settings.

To set the system to log on automatically,

– Select the **System Auto Login** check box.

To create a user ID,

1. Click **New**.
2. Enter a user ID in the ***ID*** field. You can enter up to 16 characters.
3. Enter the patient information using the alphanumeric keyboard.
4. Enter a new password in the ***New Password*** field.
5. Enter the new password again in the ***Confirm*** field.
6. Click **OK** to save your settings.

NOTE

- Use alphanumeric keys only for the user ID. Do not enter symbols such as asterisk (*), question mark (?), and slash (/).
- After saving, you can edit all information except for the user ID.

To delete a user ID,

1. Select a user ID from the user list by using **[Trackball]**.
2. Click **Delete**.
3. Click **Yes** to save the changes.

To change the password,

1. Select a user ID from the user list by using **[Trackball]**.
2. Click **Password**.
3. Enter the current password in the ***Old Password*** field.
4. Enter a new password in the ***New Password*** field.
5. Enter the new password again in the ***Confirm*** field.
6. Click **OK** to save the changes.

Options

The **Options** menu allows you to view the status of optional functions that require license keys to be installed. The followings show the current status of the selected function.

- **Trial. 90 days remain.**: The option is activated for 3 months after the activation.
- **Invalid**: The option is not installed.
- **Permanent**: The option is installed permanently.

To add or delete a license key, go to **Service Station**.

System Info

The **System Info** menu allows you to view the current software and hardware versions of your system.

Patient Data

The **Patient Data** menu allows you to delete the patient data for a specified period.

- **Delete include Patient Information**: Set to delete the patient information when you delete the patient data for a specified period.

Advanced Cardiac

Protocol Editor

The **Protocol Editor** preset allows you to manage protocols to be used for Stress Echo. You can add, copy, and delete protocols, stages, and views.

Adding a new protocol

1. From the **Protocols** category, click **Add**.
2. Enter a new protocol name and select **OK**.
3. Select **Add** to add a new stage on the **Stages** category.
4. Enter a stage name and specify the stage options (Capture mode, Clips per view, Preview, Capture length, Capture Delay(ms), Timer Type).
5. Select **OK**.
6. Select **Add** to add a new view on the **Views** category.
7. Select a view name from the drop-down list and select **OK**.

Managing a protocol, stage, and view

To change the order of the stages or views,

– Select **Up** or **Down** to move a desired stage or view from the corresponding category.

To copy a protocol, stage, or view,

1. Select **Copy** to copy a desired protocol, stage, or view.
2. Enter a name for the selection and select **OK**.

To delete a protocol, stage, or view,

1. Select **Delete** to delete a desired protocol, stage, or view.
2. Select **Yes** to confirm the deletion.

Image Compress

The **Image Compress** menu allows you to set the compression strength of the stress echo images. Available options are High (30 %), Medium (50 %), Low (70 %), and Uncompress (100 %).

Cube Strain™

The **Cube Strain™** menu allows you to set the image capture time for the Cube strain™ function.

Image Preset

The Image Preset allows you to configure the settings for displaying images and application-specific settings.

The Image Preset contains the following submenus:

- General
- Application

General Workflow

Accessing Image Preset menus

To access the Image Preset menu,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **ImagePreset** tab on the touch screen. Or press the **[Image Preset]** key on the QWERTY keyboard.
   The ***Image Preset*** screen appears.

Changing Image Preset parameters

To change the Image Preset parameters,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **ImagePreset** tab on the touch screen. Or press the **[Image Preset]** key on the QWERTY keyboard.
   The ***Image Preset*** screen appears.
4. Select the preset menu on the touch screen.
5. Select the desired transducer from the transducer list.
6. Select the desired application from the application list.
7. Change values for the parameters you want to change.
   To change a parameter, do one of the following:
   - Select the value from a dop-down list.
   - Select or clear a check box.
8. When you have finished, click **Save & Exit** to save the changes and return to scanning.

Exiting Image Preset

There are several methods to exit Image Preset.

– Click **Save & Exit** or **Exit**.

– Press the **[Image Preset]** on the QWERTY keyboard.

– Press the **[2D]** key on the control panel.

Creating a New Preset

You can create a new preset by pressing the **[F7]** key on the QWERTY keyboard. Once you have added a new preset, it appears in the application list of the transducer selection page, the ***Patient*** screen, and the ***Image Preset*** screen. This function is useful when you want to use user-defined presets easily.

To create a new preset,

1. Adjust the image parameter settings as you want, and then press the **New Preset** key on the QWERTY keyboard.
2. Select the application that you want to add from the ***Application*** list.
3. Enter a preset name in the ***Preset Name*** field.
4. To show the automatic preset selection when you change the transducer, select the **Automatic Preset selection when changes the transducer** check box.
5. Select **Library Setting** to assign default Measurement, Annotation, Body Pattern library for the rpeset.
6. Select the library from the ***Body Pattern, Annotation and Measurement*** list.
7. When you have finished, click **OK**.

To overwrite an existing preset,

1. Adjust the image parameter settings as you want, and then press the **New Preset** key on the QWERTY keyboard.
2. Select the application that you want from the ***Application*** list.
3. Enter the preset name that you want to overwrite on the ***Preset Name*** list.
4. To show the automatic preset selection when you change the transducer, select the **Automatic Preset selection when changes the transducer** check box.
5. When you have finished, click **OK**.
6. Click **Yes** to confirm.

To delete a preset,

1. Press the **[Image Preset]** key on the QWERTY keyboard.
2. Select the preset that you want to delete from the ***Preset Name*** list, and then press the **Delete Preset** soft key.
3. When the **Delete** dialog box appears, click **Yes** to confirm.

NOTE

The default presets cannot be deleted.

General

The **General** menu allows you to configure the settings for displaying images.

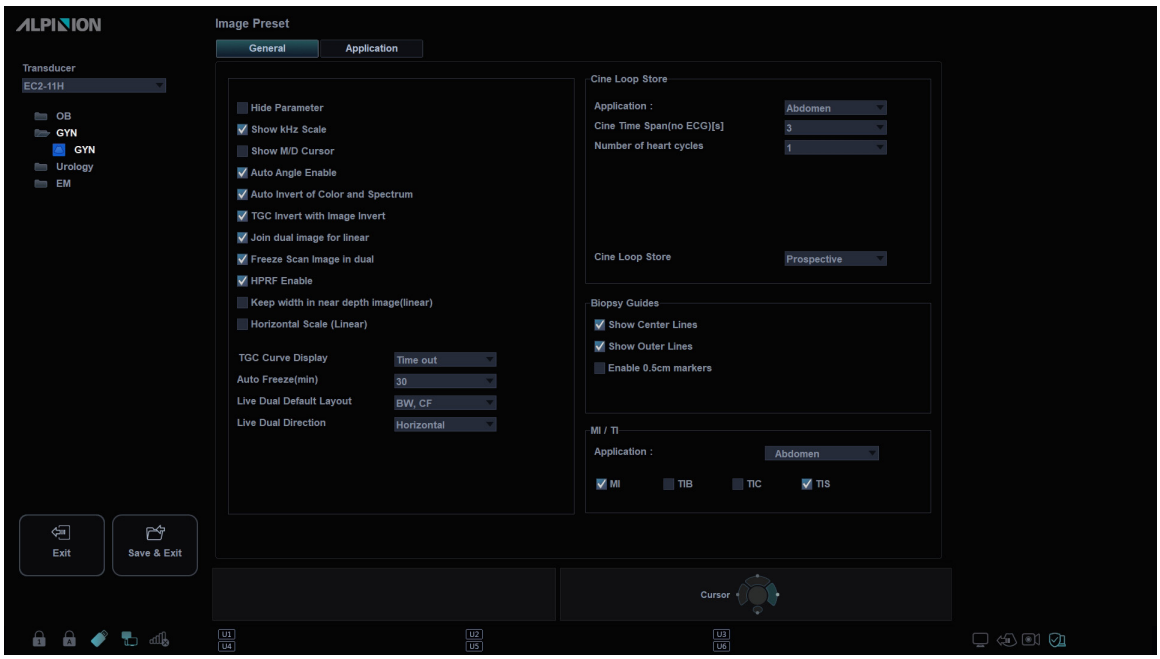


Figure 5-17 Image Preset_General Display

- **Hide Parameter**: Hide the image information.
- **Show Khz Scale**: When selected, displays the kHz scale on the left side of the Doppler spectrum.
- **Show M/D Cursor**: Select to display M/D cursor in 2D mode.
- **Auto Angle Enable**: Select to keep the angle constant with regard to the anatomy.
- **Auto Invert of Color and Spectrum**: When selected, the Doppler timeline scale inverts along with the color ROI.
- **TGC Invert with Image Invert**: When inverting the image, TGC curve is inverted simultaneously.
- **Join dual image for linear**: Select to place linear transducer dual images directly next to each other.
- **Freeze Scan Image in dual**: Select to carry over the live image's imaging parameters to the other image after pressing **[Freeze]** key.
- **HPRF Enable**: Select whether to enable HPRF, which is supported in PW Spectral Doppler mode.
- **Keep width in near depth image(linear)**: Show the full image of the linear transducer. When the sides of an ultrasound image are not visible at a low depth, use this function to view the entire image.
- **Horizontal Scale (Linear)**: Select to display width markers.
- **TGC Curve Display**: Select to display TGC curve.
- **Auto Freeze(min)**: Automatically freezes the system after few minutes of inactivity.
- **Live Dual Default Layout**: Select to set up the Live Dual default layout.
- **Live Dual Direction**: Select to set up the Live Dual direction.

Cine Loop Store

- **Application:** Select the application to configure cine loop store from application list.
- **Cine Time Span(no ECG)[s]**: Select the number of seconds of cine loop storage. The default is 3 seconds.
- **Number of heart cycles**: Select the number of heart cycles to store.
- **Cine Loop Store**: Select to store a cine loop retrospectively or prospectively. (Prospective or Retrospective)

Biopsy Guides

- **Show Center Lines**: Display center biopsy guideline.
- **Show Outer Lines**: Display outer biopsy guidelines.
- **Enable 0.5cm markers**: Activate biopsy depth markers every 0.5cm.
- **Show Biopsy Mark on Simultaneous Mode**: Display the Biopsy Guideline on the image while in Simultaneous Mode.

MI / TI

Set the display of mechanical and thermal indices (MI/TI) for each application.

- **MI**: Mechanical Index
- **TIB**: Bone Thermal Index
- **TIC**: Cranial Thermal Index
- **TIS**: Soft Tissue Thermal Index

Application

The **Application** menu allows you to specify the default application to be shown when the system starts up. You can also configure the default settings of transducer.

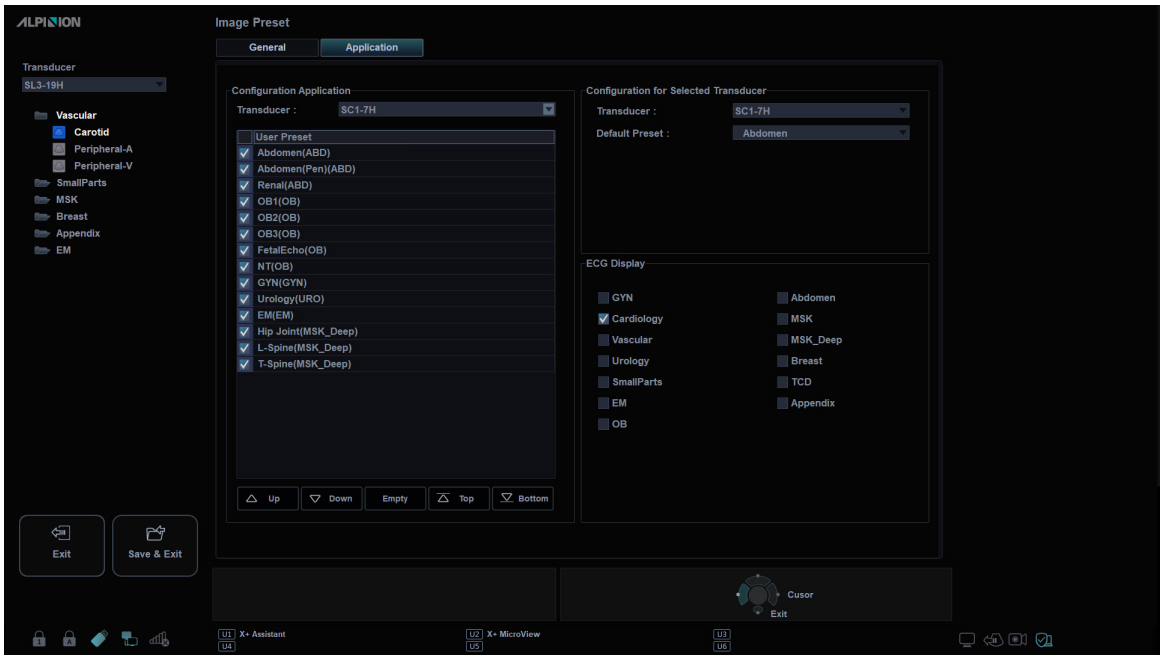


Figure 5-18 Image Preset_Application Display

Configuration for Selected Transducer

To specify a default application per transducer which starts automatically,

1. Select the transducer from the ***Transducer*** drop-down list.
2. Select the application from the ***Default Preset*** drop-down list.

Configuration Application

To specify applications per transducer,

1. Select the transducer from the ***Transducer*** drop-down list.
2. Select application(s) from the ***User Preset*** list.
3. If necessary, you can change the order of the applications.
   Applications are listed in the order in which they are displayed on the touch screen.
   - To change the order of the applications, select the application and click **Up**, **Down**, **Top** or **Bottom**.
   - Click **Empty** to make an empty space on the touch screen.

ECG Display

Enable or disable ECG for each application.

6

Imaging Modes

This chapter describes the general functions of the imaging modes.

2D Mode

In 2D mode ultrasound, your transducer simultaneously scans a plane through the body that can be viewed as a two-dimensional image on the screen. Two-dimensional images and measurements of the anatomical structures of soft tissues such as internal organs and vascularities can be determined.

2D Mode Display

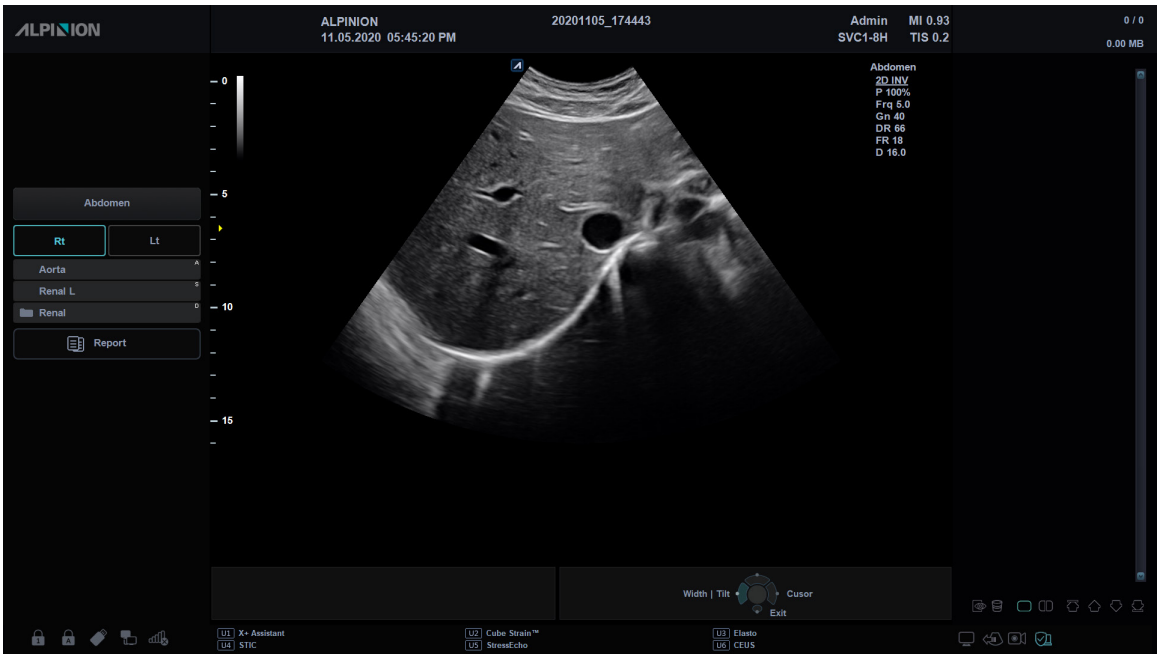


Figure 6-1 2D Mode Display

General Workflow

To perform an examination using 2D mode,

1. Press the **[2D]** key on the control panel to start 2D mode.
2. Use the following controls for image optimization:
   - **[2D]** key (rotate to adjust 2D mode gain)
   - **[Depth]** and **[Focus]** keys
   - **[TGC]** slide controls

   NOTE

   To reset the current image settings, press the **[Initial]** key on the QWERTY keyboard.
3. Use additional soft keys, if necessary.
4. To enter another imaging mode, press the corresponding mode key.
5. Press the **[2D]** key to return to 2D mode from another imaging mode.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

Figure 6-2 2D Mode Touch Screen

Gain

Increase or decrease in the amount of echo information displayed in an image. It may have the effect of brightening or darkening the image if sufficient echo information is generated.

Adjusting the gain

Increase or decrease the sensitivity of the instrument. You can use two controls to adjust gain: The overall gain control and TGC. To increase or decrease overall gain, rotate the **[2D]** key on the control panel.

Gain values

Gain is shown as **Gn** on the display. Gain values may vary depending on the transducer, application, and frequency setting.

Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Remarks

Commonly, you need to decrease the gain when you increase the Power Output; to increase the gain, decrease the power output. Gain and TGC interact by adding together.

Depth

Increasing the depth enables the deeper structures to be visualized. You can decrease the depth if you do not need the bottom portion of the display.

Adjusting Depth

To increase or decrease the depth, rotate the **[Depth]** key clockwise or counter- clockwise on the control panel. You can see the display and image parameters are automatically changed.

Depth values

Maximum and minimum depth selections are dependent on the frequency of the transducer you are currently using.

NOTE

- You might adjust TGC and focus with depth adjustment. Adjusting depth erases real-time calculations of the graphic on the screen (but not the completed results on the worksheet page).
- Incrementing depth depends on what transducer and application you use. When you change the transducer, application, preset, or click **New Patient** on the ***Patient*** screen, depth parameters are set to the factory or user preset settings.

Xpeed™

Xpeed™ is an auto-optimizing technology that enables you to easily adjust an image's the contrast resolution and brightness uniformity. For using this feature, you need an additional request to your local agent.

Activating Xpeed

To activate or deactivate Xpeed, press the **[Xpeed]** key on the QWERTY keyboard.

Time Gain Compensation (TGC)

To compensate for weak signals or over-bright signals at various depths, you can adjust Time Gain Compensation (TGC) using the TGC slide controls. The 2D control adjusts the overall receiver gain and compensates for the brightness of the image.

Adjusting TGC

TGC slide control selectively adjusts the sensitivity (brightness) in depth.

– Slide the slide control to the left to decrease the gain in the corresponding specific 2D depth.

– Slide the slide control to the right to increase the gain in the corresponding specific 2D depth.

TGC values

TGC compensates for attenuation in tissue by increasing the receiver gain as a function of time following each transmit pulse.

Focus

Convex array, linear array, and phased array transducers support multiple transmit focus zones, which you can select in 2D-mode images. Focal zone markers display on the left side of the image screen.

Focus Num

Focus Num is used to control the number of focal points.

- **Adjusting Focus Num**
  To increase or decrease the number of focal zones, press the **[Focus]** key on the control panel and then rotate the key clockwise or counter-clockwise.
- **Focus Num values**
  Focal zone number may vary depending on the depth, zoom, transducer, application, and selected frequency setting. Focus Num values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Focus Pos

Focus Pos is used to change the location of the focal point. A triangular focus marker indicates the depth of the focal point.

- **Adjusting the focus position**
  To move the focal zone to the near/far field, rotate the **[Focus]** key on the control panel.
- **Focus Pos values**
  Focal zone position may vary depending on the depth, zoom, transducer, application, and selected frequency setting.

Remarks

Using multiple focal zones causes a reduction in the frame rate. The amount of frame rate reduction depends on the depth of view and the transducer.

Dual/Quad Imaging

Using Dual (or Quad) imaging, you can view two (or four) images at the same time on the display. Dual or quad imaging is available in all 2D live imaging modes, M mode, Color Flow mode, and TDI mode.

Activating Dual/Quad imaging

To activate and exit the image layout,

1. In 2D mode, Color Flow mode, or M mode imaging, press the **[Dual]** (or **[Quad]**) key on the control panel. The image is shown on the left of the display.
2. Press the **[Dual]** (or **[Quad]**) key again to activate the second image.
3. To switch between the two (or four) images, press the **[Dual]** (or **[Quad]**) key.
4. Press the **[2D]** key to exit the dual (or quad) imaging.

Priority

The priority function has the following two options: Width, Tilt

Width

Control the size or angle width of the 2D image sector. A smaller angle generally produces an image with a higher frame rate.

You can widen or narrow the size of the sector angle to maximize the image's region of interest (ROI).

- **Adjusting the width**
  To narrow or widen the ROI, press the **[Priority]** key on the control panel. **Width** is highlighted in the message line. Move **[Trackball]** left or right to decrease or increase the angle size. Then, press the **[Priority]** key to set the region of interest (ROI).
- **Width values**
  Width values may vary depending on the transducer (not applicable for linear transducers) and application.

Tilt

After the size or angle width of the 2D image sector is set, you can steer the image sector by using the tilt option. Press the **[Priority]** key to select the tilt function. Then move **[Trackball]** to tilt the angle.

NOTE

The priority function may not be available with linear transducers.

Up/Down (If Preset)

Up/Down allows you to flip the image 180 degrees up/down.

Activating Up/Down

To flip the image vertically, press the **U/D Flip** key on user-defined key.

NOTE

To assign the Up/Down function to user-defined key, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **U/D Flip**.

Up/Down values

Up/Down values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Angle Steer

In 2D mode, you can tilt an image left or right by using a linear transducer.

Adjusting Angle Steer

To adjust the angle steer, rotate the **[Angle]** key clockwise or counter- clockwise on the control panel. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when Virtual Convex is applied to the current image.

Reverse

Reverse allows you to flip the image 180 degrees left/right.

Activating Reverse

To flip the image horizontally, press the Я key on the QWERTY keyboard.

Harmonic

Tissue Harmonic Imaging (THI) is a system feature that can enhance the contrast resolution with fine tissue differentiation, benefiting patients with poor images. THI creates images from received signals using the harmonics of the transmitted frequency.

For certain applications, Filtered THI (FTHI) can be used to optimize temporal resolution. The frame rate of FTHI is higher than THI between similar images. To use the FTHI function, you need an additional request to your local agent.

For certain applications, Pulse Inversion THI (PTHI) can be used to optimize lateral and contrast resolution. The frame rate of PTHI is half of THI between similar images. To use the PTHI function, you need an additional request to your local agent.

Adjusting FTHI

To adjust FTHI,

1. Select **Harmonic** on the touch screen. **2D HAR** appears next to 2D image parameters.
2. To change the frequency of FTHI, rotate the **Frequency** soft key clockwise or counter-clockwise.
3. To exit THI, select **Harmonic** again.

Adjusting PTHI

To adjust PTHI,

1. Select **INV** on the touch screen. **2D INV** appears next to 2D image parameters.
2. To change the frequency of PTHI, rotate the **Frequency** soft key clockwise or counter-clockwise.
3. To exit THI, select **INV** again.

Harmonic values

Harmonic values are On and Off.

NOTE

Changing multi-frequency resets those parameters which are presettable by frequency to their preset values for the current harmonic frequency. Multi frequency values are returned to the factory or user preset value when you change one of the followings: Transducer, application.

TDI (Tissue Doppler Imaging)

TDI switches to Tissue Doppler Imaging (TDI) mode. For more information on Tissue Doppler Imaging (TDI), see "Tissue Doppler Imaging (TDI) Mode" on page 6-55.

Activating TDI

To switch to TDI mode, select **TDI** on the touch screen.

TDI values

TDI values are On and Off.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time.

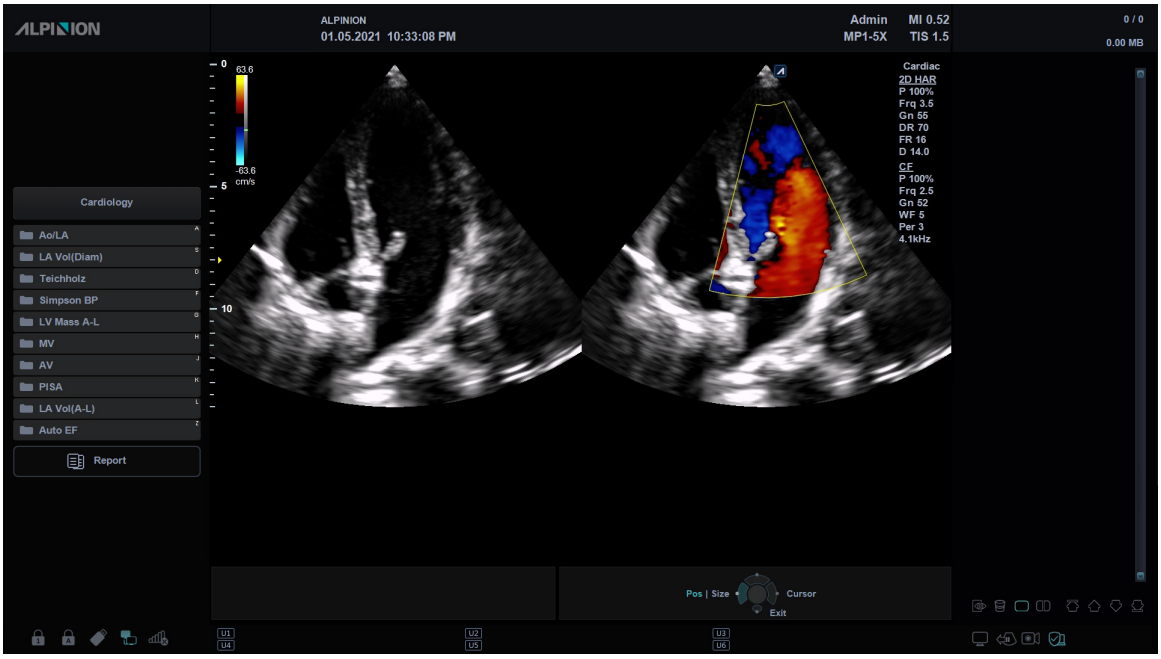


Figure 6-3 Live Dual Display

The following combination imaging modes are available:

– 2D(BW), 2D(BW)
– 2D(BW), Color Flow(CF)
– 2D(BW), Power Doppler(PD)
– Color Flow(CF), 2D(BW)
– Power Doppler(PD), 2D(BW)

NOTE

You can set up the Live Dual Default Layout in Image preset menu. In Live Dual, the current imaging mode takes priority over the default layout values.

Activating Live Dual

To activate Live Dual, select **Live Dual** on the touch screen. You can change the imaging mode by pressing the **[CF]** key.

NOTE

Live Dual may not be available when the image is frozen or rotated 90/270 degrees.

Live Dual values

Live Dual values are On and Off.

Virtual Convex

On linear transducers, Virtual Convex provides a larger field of view in the far field.

Activating Vrtual Convex

To activate Virtual Convex, select **Virtual** on the touch screen. The rectangular frame provided by a linear transducer is changed to a trapezoidal shape.

To deactivate Virtual Convex, select **Virtual** again.

Virtual Convex values

Virtual Convex values are On and Off. Virtual Convex allows for a wider field of view. This is available in 2D mode, Color Flow mode, and Doppler mode.

Line Density

Line Density optimizes 2D mode frame rate or spatial resolution for the best possible image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles).

Adjusting the line density

Line Density changes the vector density and frame rate. To adjust the line density, select **<** or **>** of **LineDensity** on the touch screen.

Line Density values

Line Density values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. A lower line density is useful in fetal heart beat, and adult cardiac.

Full SRI™

Full SRI™ is a more powerful SRI feature that allows you to adjust the SRI level according to your image condition or imaging mode. The full SRI feature is available in 2D, 3D, and 4D modes. For using this feature, you need an additional request to your local agent.

Adjusting Full SRI

To adjust Full SRI, select **<** or **>** of **FullSRI** on the touch screen.

Full SRI values

Full SRI values are 0 to 5.

Spatial Compound

Spatial Compound allows you to combine different steering frames to form a single frame at real-time frame rates.

Adjusting the spatial compound

To adjust the spatial compound, select **<** or **>** of **Spt.Comp** on the touch screen.

Spatial Compound values

Spatial compound values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

NOTE

The spatial compound function may not be available with phased array transducers.

Rotation

In 2D mode, you can rotate an image clockwise by 90 degrees.

Adjusting the rotation

To adjust the rotation, select **<** or **>** of **Rotation** on the touch screen.

Rotation values

Rotation values are 0, 90, 180, and 270.

S-FOV

On convex transducers, S-FOV provides larger field of view in the far field.

Activating S-FOV

To activate or deactivate S-FOV, select  on the touch screen.

EX-FOV

On endocavity transducers, EX-FOV provides wide angle field of view.

Activating EX-FOV

To activate or deactivate EX-FOV, select  on the touch screen.

Sepia

Sepia function is used to activate the sepia map.

Activating the sepia map

To activate or deactivate the sepia map, select **Sepia** on the touch screen.

Sepia values

Sepia values are On and Off.

PRF (Pulse Repetition Frequency)

In Multi-frequency mode, PRF function is s used to reduce noise artifacts in the image. When you activate PRF, the frame rate decreases and the noise artifacts are filtered.

Activating PRF

To activate or deactivate PRF, select **PRF** on the touch screen.

PRF values

PRF values are On and Off.

VelocityUs

VelocityUS allows you to change the transmitted speed of sound for various tissue types.

Adjusting VelocityUS

To adjust the transmitted speed of sound, select **<** or **>** of **VelocityUS** on the touch screen.

VelocityUS values

VelocityUS values are 1460, 1480, 1500, 1520, and 1540.

Frequency

You can adjust the operating frequency of the transducer. The selected frequency is displayed in the Image Parameter.

Changing the frequency value on the display is selecting different transmit patterns associated with that value, including transmit pulse shape, frequency and transmit sequence.

Adjusting the frequency

To adjust the frequency, rotate the **Frequency** soft key clockwise or counter-clockwise.

NOTE

Changing the frequency may not be available when the image is frozen.

Frequency values

Frequency values may vary depending on the transducer and application.
The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Dynamic Range

Dynamic Range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible.

Adjusting the dynamic range

To adjust the dynamic range, rotate the **DR** soft key clockwise or counter-clockwise.

NOTE

When the dynamic range is set high, the image is softer and more low-level data is visible.

Dynamic Range values

Dynamic Range values are 30 dB to 250 dB. Dynamic Range operates in real-time, freeze, Cine, and Cine timeline, but is not available during the VCR playback. It also affects Gain.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes.

Adjusting the gray map

To adjust the gray map, rotate the **Gray Map** soft key to clockwise or counter-clockwise.

Gray Map values

Gray maps gradually change from the least contrasty or softest to the most contrasty. Gray Map values may vary depending on the transducer.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode.

Adjusting the colorize

To adjust the colorize, rotate the **Colorize** soft key clockwise or counter-clockwise.

Colorize values

Colorize values are 0 to 42.

Image Size

Image SIze allows you to specify the 2D image size.

Adjusting the image size

To adjust the image size, rotate the **Image Size** soft key clockwise or counter-clockwise.

Image Size values

Image Size values are 70% to 130%. The each level of increment/decrement is 5 percentage.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

Adjusting the rejection

To adjust the rejection values, rotate the **Reject** soft key clockwise or counter-clockwise.

NOTE

When you increase the rejection, low-level echoes are rejected and appear in the 2D image.

Reject values

Reject values are 0 to 10.

Power

Power controls the amount of acoustic power applied in all modes.

Adjusting the power

To adjust the power, rotate the **Power** soft key clockwise or counter-clockwise.

Power values

Power values are 1 to 100.

Edge Enhance

Edge Enhance demonstrates subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. This function allows your system to display the outline of tissues or an organ more clearly.

Adjusting Edge Enhance

To adjust Edge Enhance, rotate the **Edge Enhance** soft key clockwise or counter-clockwise.

NOTE

Edge Enhance may not be available in freeze mode or in Cine mode.

Edge Enhance values

Edge Enhance values are 0 to 10.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging.

Adjusting the persistence

To adjust the persistence, rotate the **Persist** soft key clockwise or counter-clockwise.

Persist values

Persist values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

M Mode

The M mode display is formed by using a stationary ultrasound beam, yielding distance/motion versus time information for reflections along a single ultrasound beam line. M mode provides a display format and measurement capability that represents tissue displacement (motion) occurring over time along a single vector.

In M mode, you can learn the movement of an area of anatomy. First, you position the M-line in the 2D image on the anatomy of Interest. Then you can display information about movement along that line in M mode trace. M mode trace can be helpful when you perform measurements, especially measuring the heart rate.

M Mode Display

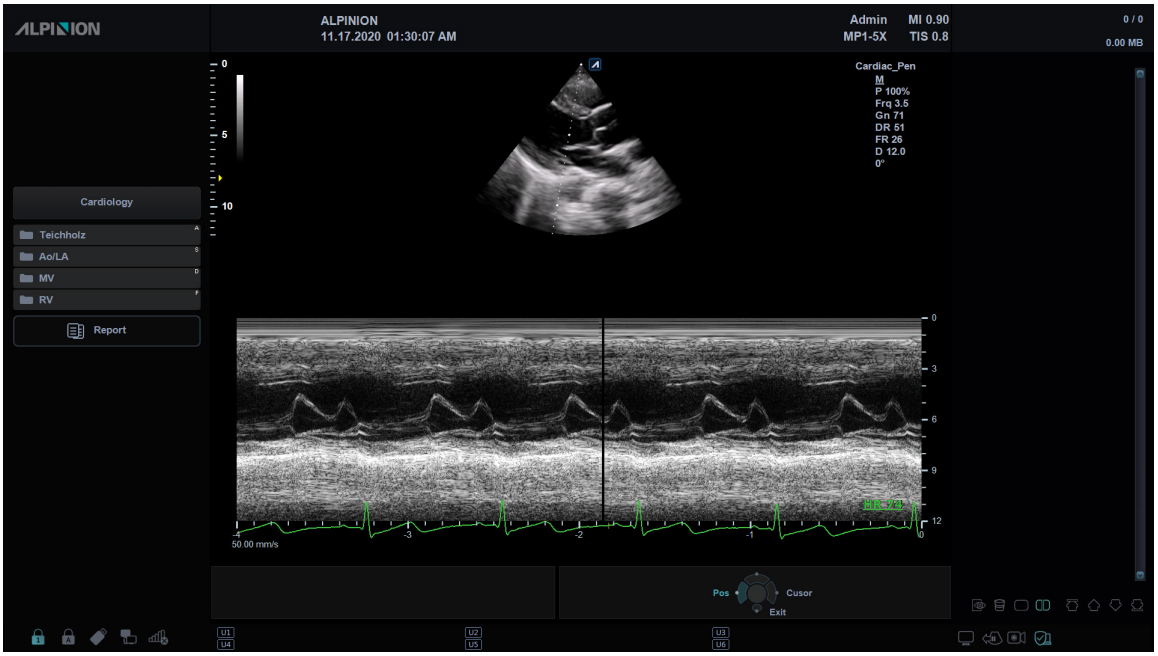


Figure 6-4 M Mode Display

General Workflow

To perform an examination using M mode,

1. On the control panel, press the **[M]** key to activate M mode.
2. Move the M-line to the anatomy of interest by using **[Trackball]**.
3. Rotate the **[M]** key to change the initial gain for M mode.
4. To change the sweep speed, select **<** or **>** of **Sweep** on the touch screen.
5. To review the M mode trace, press the **[Freeze]** key, and use **[Trackball]** to scroll forward or backward.
6. To exit M mode, press the **[2D]** key.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

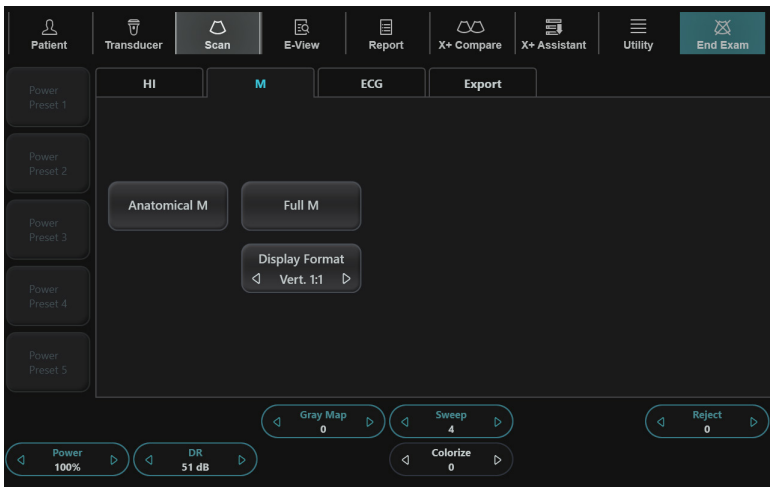


Figure 6-5 M Mode Touch Screen

Gain

With the Gain control, you can adjust the brightness of M mode image. The adjustment of the Gain control determines the amount of amplification applied to the received echoes. All received echoes are amplified with the same gain value regardless of the scan depth. The M Gain function influences the M trace only.

To adjust the brightness of the entire image, rotate the **[M]** key on the control panel.

- Rotate the **[M]** key clockwise to increase the brightness.
- Rotate the **[M]** key counter-clockwise to decrease the brightness.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 6-13.

TGC Slide Controls

In M mode, the TGC slide controls have the same functions in 2D mode. See "Time Gain Compensation (TGC)" on page 6-5 for more information.

Depth

In M mode, the depth function is the same as the one in 2D mode. See "Depth" on page 6-4 for more information.

Cine

In M mode, image trace information can be recalled. When freezing an image, a certain time frame (M information of the last examination sequence) is stored in the loop memory. The sequence can be reviewed second by second.

Full Timeline

Full Timeline expands the display to full timeline display.

Activating the full timeline

To activate or deactivate the full timeline, select **Full M** on the touch screen.

Full Timeline values

Full Timeline values are On and Off.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed.

Adjusting the display format

To adjust the display format, select **<** or **>** of **Display Format** on the touch screen.

NOTE

This function can not be adjusted when Full M is activated.

Display Format values

Display Format values are as follows: Vert. 1:1, Vert. 1:2, Vert. 2:1, Horiz. 1:1, Horiz. 1:2, Horiz. 2:1.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 6-15.

Dynamic Range

Dynamic Range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 6-13.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 6-14.

Sweep Speed

During M mode imaging, you can adjust the sweep speed of the display.

Adjusting the sweep speed

To increase or decrease the sweep speed, rotate the **Sweep** soft key clockwise or counter-clockwise.

Sweep Speed values

Sweep Speed values are 0 to 10.

Remarks

You can speed up or slow down the timeline to see more or fewer occurrences over time.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 6-14.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 6-14.

M Mode zoom

When the system is in M mode, you can magnify a portion of the reference image using M mode zoom function.

To adjust the M mode zoom,

1. In M mode or 2D mode with the M-line displayed, press the **[Zoom]** key on the control panel to activate Write zoom. To activate Read zoom, rotate the **[Zoom]** key.
2. Use **[Trackball]** to position the zoom box and M line in the zoomed image, and press the **[Set]** key.
3. Use **[Trackball]** to adjust the size of the zoom box, and press the **[Set]** key.
4. To zoom out, press the **[Exit]** key.

Anatomical M Mode

Anatomical M mode allows you to move or rotate an M line and review an image on the desired region. For using this feature, you need an additional request to your local agent.

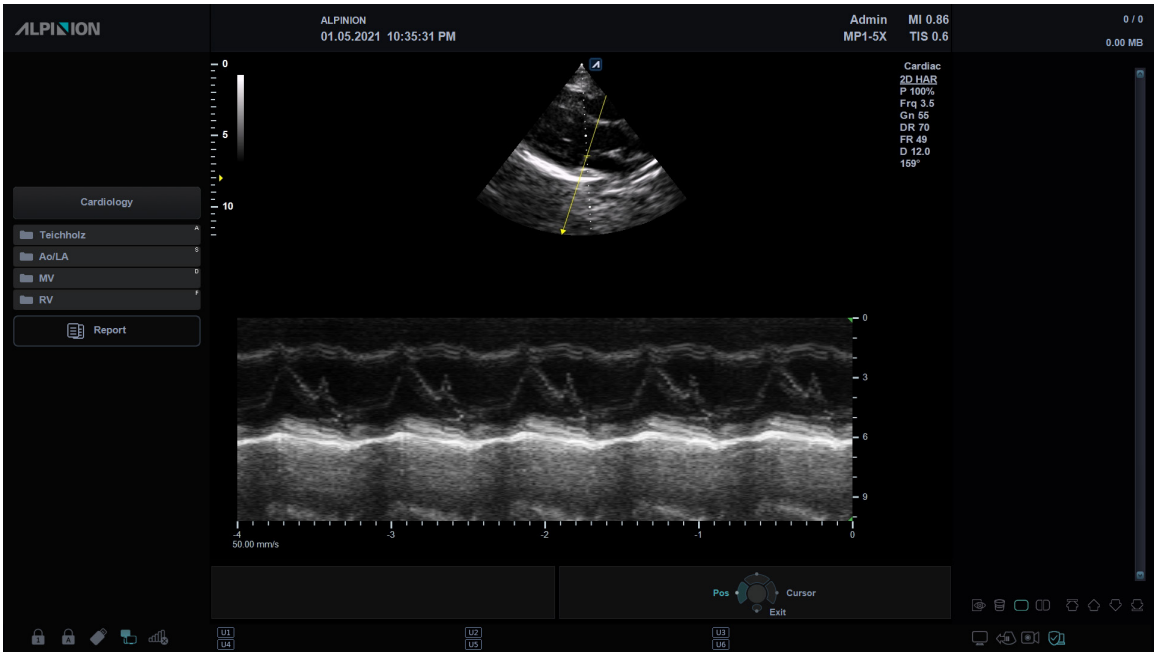


Figure 6-6 Anatomical M Mode Display

To activate Anatomical M mode,

1. In M mode, select **Anatomical M** on the touch screen.
   The cursor line of the Anatomical M mode appears in the middle of a 2D image.
2. Use **[Trackball]** to move the cursor line (left/right/up/down).
3. Rotate the **[Angle]** key on the control panel to rotate the angle.

M color mode

M color mode is a combination mode of M mode and Color Flow mode which color flow information overlays the M mode image by using the velocity and color map. The color flow wedge is shown on the M-mode timeline. The color map in this mode is the same as in Color Flow mode, but the size and position of the color flow window depends on the 2D mode image.

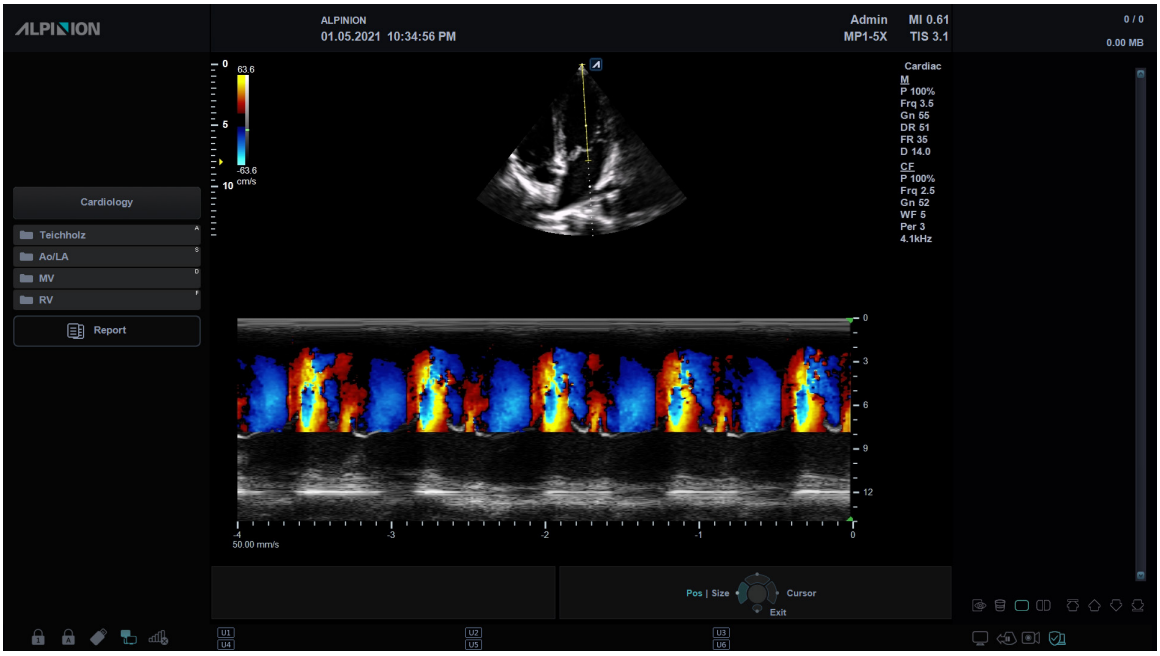


Figure 6-7 Color M Mode Display

To activate M color mode,

1. Press the **[M]** key, and then press the **[CF]** key.
2. To switch to Color Flow mode, press the **[M]** key.
   To return to M color mode, press the **[M]** key again.

Color Flow (CF) Mode

Color Flow mode is useful when you see the flow in a broad area. Color flow allows visualization of the flow in the CF ROI whereas Doppler mode provides spectral information in a smaller area.

Color Flow mode is also used as a stepping stone to Doppler mode. Use Color Flow mode to locate flow and vessels before activating Doppler mode.

CF Mode Display

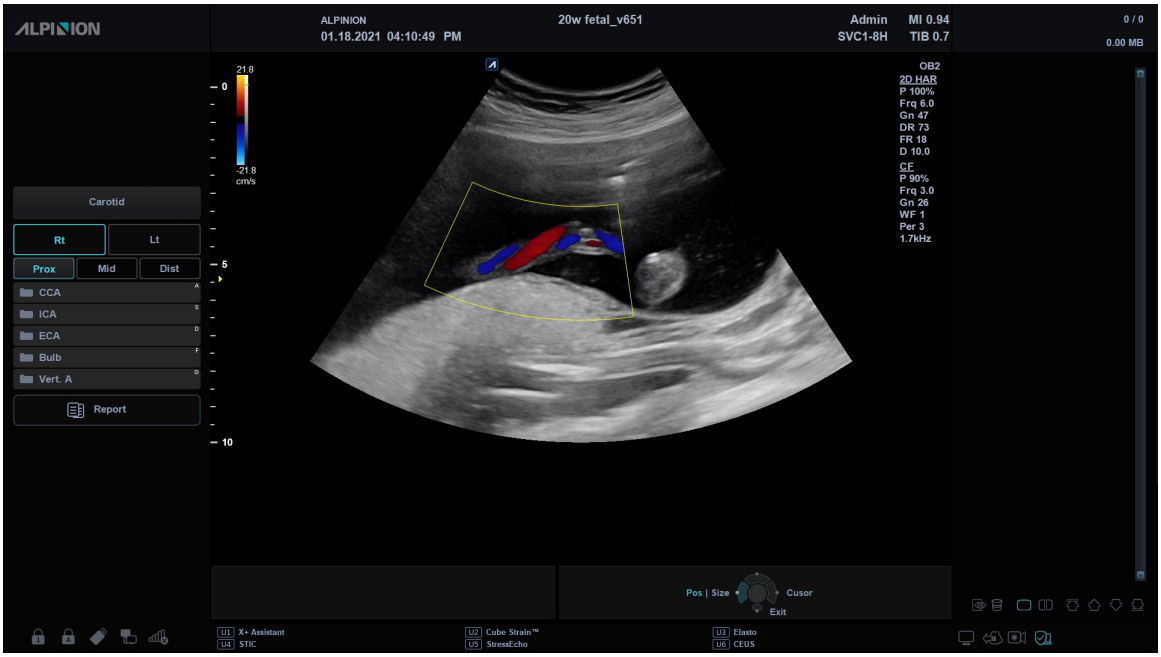


Figure 6-8 CF Mode Display

General Workflow

To perform an examination using CF mode,

1. Press the **[CF]** key on the control panel. The CF window appears over the 2D mode image.
2. Move the cursor to the CF window by using **[Trackball]**.
3. Use **[Trackball]** to change the position of the color ROI.
4. Press the **[Set]** key and use **[Trackball]** to change the size of the color ROI.
5. Press the **[Set]** key to move the color ROI to the left or right.
6. Press the **[Freeze]** key to hold the image in the memory.
7. Record color flow images, if necessary.
8. To exit Color Flow mode, press the **[CF]** or **[2D]** key.

The combination imaging modes of Color Flow Mode and Power Doppler Mode

The following combination imaging modes are available:

– 2D mode with Color Flow or Power Doppler
– 2D mode with color and zoom
– 2D/Doppler mode with Color Flow or Power Doppler

Color Flow Imaging Parameters

Use the ultrasound system controls and soft key selections to change the settings for imaging parameters. The system increases the lighting intensity of the control or key associated with the active function.

Positioning, sizing, and steering the ROI

When you press the **[CF]** key in 2D mode, the color window or ROI appears on the image.

The initial location and the shape of the window depend on the active transducer and default imaging depth.

Changing the size and position of the color ROI

1. Press the **[CF]** key on the control panel. The system places the ROI, outlined in solid yellow, on the image.
2. Use **[Trackball]** to reposition the ROI.
3. To resize the ROI, press the **[Set]** key and move **[Trackball]**. The system outlines the ROI with a dotted yellow line with solid corners.
4. Press the **[Set]** key to set the size.
5. To exit Color Flow mode, press the **[CF]** or **[2D]** key.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

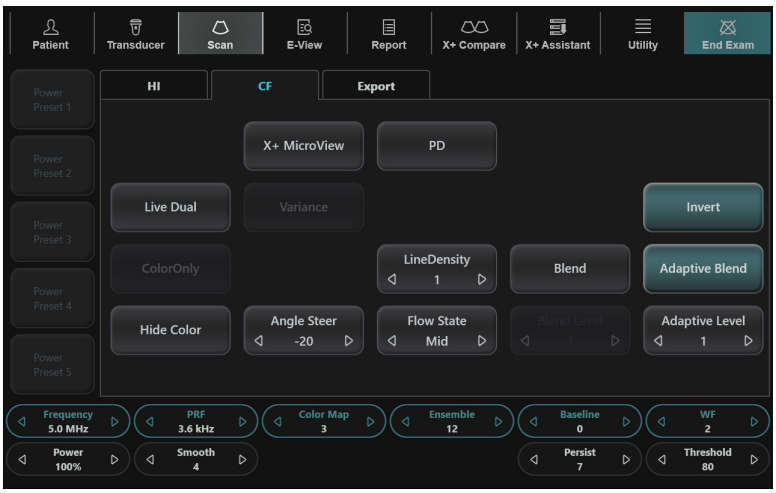


Figure 6-9 CF Mode Touch Screen

Gain

Gain amplifies the overall strength of echoes processed in the Color Flow window or spectral Doppler timeline.

Adjusting the gain

- Rotate the **[CF]** key clockwise to increase the gain; rotate the key counter- clockwise to decrease the gain.
- Rotate the **[CF]** key to adjust the receive gain for color without affecting the 2D mode image gain.

Gain values

Gain values may vary by transducer, application, and multi-frequency setting. Gain value is shown as **Gn** on the display. Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

TDI (Tissue Doppler Imaging)

TDI switches to Tissue Doppler Imaging (TDI) mode. For more information on Tissue Doppler Imaging (TDI), see "Tissue Doppler Imaging (TDI) Mode" on page 6-55.

Activating TDI

To switch to TDI mode, select **TDI** on the touch screen.

TDI values

TDI values are On and Off.

X+ MicroView (Micro Vascular Imaging)

X+ MicroView switches to Micro Vascular Imaging (MVI) mode. For more information on Micro Vascular Imaging (MVI), see "Micro Vascular Imaging (MVI)" on page 6-39.

Activating MVI

To switch to MVI mode, select **X+ MicroView** on the touch screen.

MVI values

MVI values are On and Off.

PD (Power Doppler Imaging)

PD switches to Power Doppler Imaging mode. For more information on Power Doppler Imaging mode, see "Power Doppler (PD) Mode" on page 6-32.

Activating PD

To switch to PD mode, select **PD** on the touch screen.

PD values

PD values are On and Off.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time. For activating or adjusting the Live Dual, see "Live Dual" on page 6-9.

Variance

Variance allows you to select variance color maps.

Activating Variance

To activate or deactivate variance color maps, select **Variance** on the touch screen.

Variance values

Variance values are On and Off.

Color Only

Color Only hides the 2D image from the display so that you can see the color image only.

Activating Color Only

To activate or deactivate Color Only, select **ColorOnly** on the touch screen.

Color Only values

Color Only values are On and Off.

Hide Color

Hide Color hides the color image from the display so that you can see the 2D image only.

Activating Hide Color

To activate or deactivate Hide Color, select **Hide Color** on the touch screen.

Hide Color values

Hide Color values are On and Off.

Angle Steer

You can tilt the ROI of the color flow image to the left or right by using a linear transducer.

Adjusting Angle Steer

To adjust the angle steer, select **<** or **>** of **Angle Steer** on the touch screen. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Line Density

Line Density optimizes the Color Flow mode frame rate or spatial resolution for the best possible color image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles).

Adjusting the line density

To adjust the line density, select **<** or **>** of **LineDensity** on the touch screen.

Line Density values

Line Density values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. A lower line density is useful in fetal heart beat, and adult cardiac.

Flow State

Flow State adjusts the PRF of the color image.

Adjusting the flow state

To adjust the flow state, select **<** or **>** of **Flow State** on the touch screen.

Flow state values

Flow state values are Low, Mid, and High. The flow state values may vary depending on the transducer and application.

Blend

Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image to demonstrate the tissues behind the color.

Activating Blend

To activate or deactivate Blend, select **Blend** on the touch screen.

Blend values

Blend values are On and Off.

Remarks

If you activate Blend, **Blend Level** is enabled on the touch screen.

Blend Level

Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the blend level

To adjust the blend level, select **<** or **>** of **Blend Level** on the touch screen.

Blend Level values

Blend Level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Adaptive Blend

Adaptive Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image (easily, rapidly) to demonstrate the tissues behind the color.

Activating Adaptive Blend

To activate or deactivate Adaptive Blend, select **Adaptive Blend** on the touch screen.

Adaptive Blend values

Adaptive blend values are On and Off.

Remarks

If you activate Adaptive Blend, **Adaptive Level** is enabled on the touch screen.

Adaptive Blend Level

Adaptive Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the adaptive blend level

To adjust the adaptive blend level, select **<** or **>** of **Adaptive Level** on the touch screen.

Adaptive Blend Level values

Adaptive Blend Level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Invert (Color Invert)

Invert allows you to view blood flow from a different perspective, e.g., red away (negative velocities) and blue toward (positive velocities). You can invert a real-time or frozen image.

NOTE

- Invert reverses the color map, NOT the color scale.
- While viewing an inverse image, be careful not to confuse over scan direction or left/right image reversal.

Activating Invert

To reverse the color flow, select **Invert** on the touch screen.
In Triplex mode, both Color Flow and Doppler mode velocity scales are inverted.

Invert values

Invert values are On and Off.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 6-13.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 6-15.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF).

Adjusting the PRF

To raise or lower the velocity scale, rotate the **PRF** soft key clockwise or counter-clockwise.

PRF values

PRF values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. PRF is in kHz.

Smooth

Smooth allows you to make a color image smoother by enhancing connection in the axial direction.

Adjusting Smooth

To adjust Smooth, rotate the **Smooth** soft key to clockwise or counter-clockwise.

Smooth values

Smooth values are 0 to 22.

Color Map

Color Map allows you to change the color map used for Color Flow mode, Power Doppler mode and Tissue Doppler Imaging mode.

Adjusting the color map

To adjust the color map, rotate the **Color Map** soft key clockwise or counter-clockwise.

Color Map values

Color Map values are 0 to 28.

Ensemble

Ensemble allows you to select the density of the scan line. With increasing the number of ensemble, the frame rate decreases.

Adjusting Ensemble

To adjust Ensemble, rotate the **Ensemble** soft key clockwise or counter-clockwise.

Ensemble values

Ensemble values are 6 to 16.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

Adjusting the baseline

To adjust the baseline, rotate the **Baseline** soft key.

Baseline values

Zero velocity follows the baseline. The total scale range remains the same. Values may vary by transducer and application. Baseline values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging. For adjusting the persistence, see "Persist" on page 6-15.

Wall Filter

Wall Filter filters out clutter signals caused from vessel movement.

Adjusting the wall filter

To raise or lower the wall filter, rotate the **WF** soft key clockwise or counter-clockwise.

Wall Filter values

Wall Filter values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change the following: Transducer, application, new patient.

Threshold

Threshold assigns the grayscale level at which color information stops.

Adjusting the threshold

To increase or decrease the grayscale threshold, rotate the **Threshold** soft key clockwise or counter-clockwise.

Threshold values

Threshold values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Power Doppler (PD) Mode

Power Doppler imaging is another way of color flow mapping technology which maps the strength of the Doppler signal from the blood flow. Power Doppler mode, unlike Color Flow mode, displays color flow imaging by using the number of reflectors that are moving. Therefore, this mode has no aliasing and is able to measure the slow blood flow.

PD Mode Display

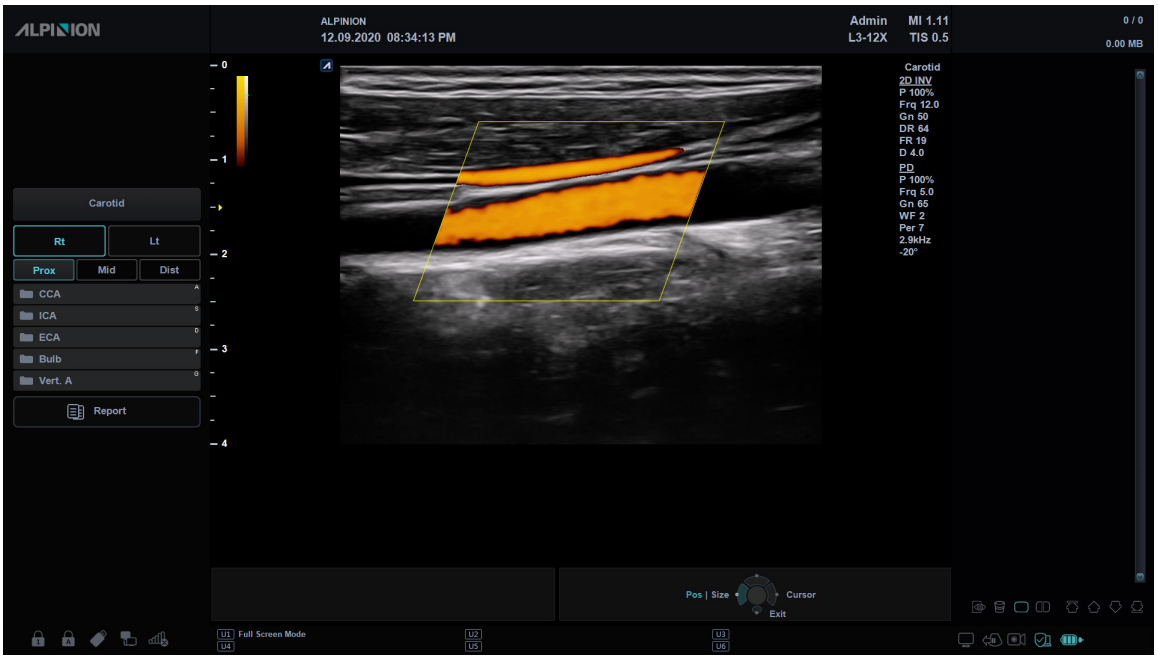


Figure 6-10 PD Mode Display

General Workflow

To perform an examination using PD mode,

1. Press the **PDI** key on user-defined key. Or in CF mode, select **PD** on the touch screen. The Power Doppler window appears over the 2D mode image.
2. Use **[Trackball]** to change the position of the color box.
3. Press the **[Set]** key and use **[Trackball]** to change the size of the color box.
4. Press the **[Set]** key.
5. Press the **[Freeze]** key to hold the image in the memory.
6. Record color flow images, if necessary.
7. To exit Power Doppler mode, press the **[2D]** key.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

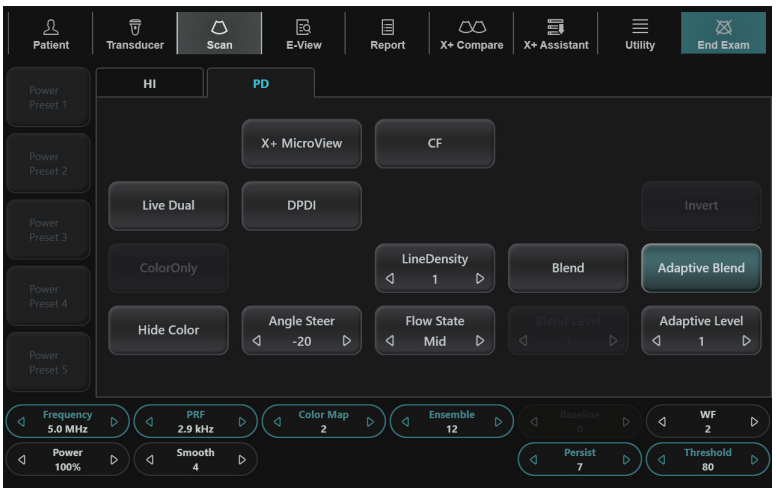


Figure 6-11 PD Mode Touch Screen

Gain

Gain amplifies the overall strength of echoes processed in the Color Flow window or spectral Doppler timeline.

Adjusting the gain

– Rotate the **[CF]** key clockwise to increase the gain; rotate the key counter- clockwise to decrease the gain.

– Rotate the **[CF]** key to adjust the receive gain for color without affecting the 2D mode image gain.

Gain values

Gain values may vary by transducer, application, and multi-frequency setting. Gain value is shown as **Gn** on the display. Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

TDI (Tissue Doppler Imaging)

TDI switches to Tissue Doppler Imaging (TDI) mode. For more information on Tissue Doppler Imaging (TDI), see "Tissue Doppler Imaging (TDI) Mode" on page 6-55.

Activating TDI

To switch to TDI mode, select **TDI** on the touch screen.

TDI values

TDI values are On and Off.

X+ MicroView (Micro Vascular Imaging)

X+ MicroView switches to Micro Vascular Imaging (MVI) mode. For more information on Micro Vascular Imaging (MVI), see "Micro Vascular Imaging (MVI)" on page 6-39.

Activating MVI

To switch to MVI mode, select **X+ MicroView** on the touch screen.

MVI values

MVI values are On and Off.

CF (Color Flow Imaging)

CF switches to Color Flow mode. For more information on Color Flow mode, see "Color Flow (CF) Mode" on page 6-22.

Activating CF

To switch to CF mode, select **CF** on the touch screen.

CF values

CF values are On and Off.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time. For activating or adjusting the Live Dual, see "Live Dual" on page 6-9.

Color Only

Color Only hides the 2D image from the display so that you can see the color image only.

Activating Color Only

To activate or deactivate Color Only, select **Color Only** on the touch screen.

Color Only values

Color Only values are On and Off.

Hide Color

Hide Color hides the color bar and the ROI box from the screen.

Activating Hide Color

To activate or deactivate the hide color, select **Hide Color** on the touch screen.

Hide Color values

Hide color values are On and Off.

Directional Power Doppler Imaging (DPDI)

DPDI (Directional Power Doppler Imaging) function shows information on the intensity and direction of blood flow.

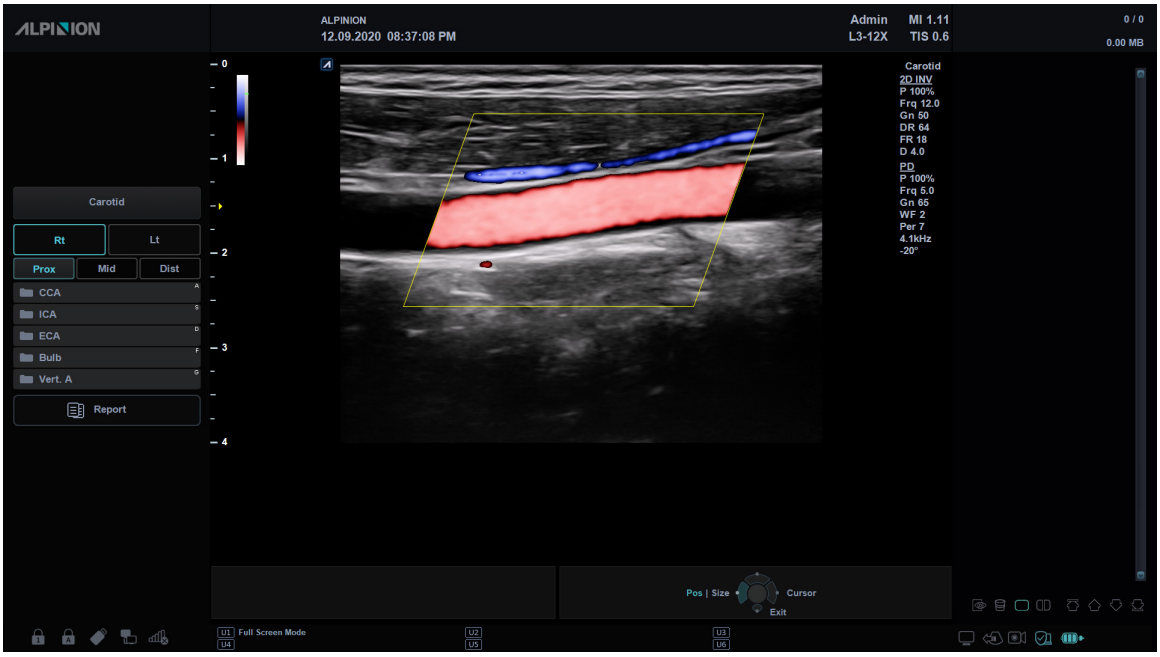


Figure 6-12 DPDI Display

Activating DPDI

To activate or deactivate DPDI, select **DPDI** on the touch screen.

DPDI values

DPDI values are On and Off.

Angle Steer

In Power Doppler mode, you can tilt an image left or right by using a linear transducer.

Adjusting the angle steer

To adjust the angle steer, select **<** or **>** of **Angle Steer** on the touch screen. The each level of the angle increment/decrement is 3 or 5 degrees depending on the linear transducer type.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Line Density

Line Density optimizes the Color Flow mode frame rate or spatial resolution for the best possible color image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles). For adjusting the line density, see "Line Density" on page 6-26.

Flow State

Flow State adjusts the PRF of the color image.

Adjusting the flow state

To adjust the flow state, select **<** or **>** of **Flow State** on the touch screen.

Flow State values

Flow State values are Low, Mid, and High. The flow state values may vary depending on the transducer and application.

Blend

Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image to demonstrate the tissues behind the color.

Activating the blend

To activate or deactivate Blend, select **Blend** on the touch screen.

Blend values

Blend values are On and Off.

Remarks

If you activate Blend, **Blend Level** is enabled on the touch screen.

Blend Level

Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the blend level

To adjust the blend level, select **<** or **>** of **Blend Level** on the touch screen.

Blend Level values

Blend Level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Adaptive Blend

Adaptive Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image (easily, rapidly) to demonstrate the tissues behind the color.

Activating Adaptive Blend

To activate or deactivate Adaptive Blend, select **Adaptive Blend** on the touch screen.

Adaptive Blend values

Adaptive Blend values are On and Off.

Remarks

If you activate Adaptive Blend, **Adaptive Level** is enabled on the touch screen.

Adaptive Blend Level

Adaptive Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the adaptive blend level

To adjust the adaptive blend level, select **<** or **>** of **Adaptive Level** on the touch screen.

Adaptive Blend Level values

Adaptive Blend Level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Invert (Color Invert)

Invert allows you to view blood flow from a different perspective, e.g., red away (negative velocities) and blue toward (positive velocities). You can invert a real-time or frozen image. For activating or deactivating the invert, see "Invert (Color Invert)" on page 6-28.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 6-13.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 6-15.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 6-29.

Smooth

Smooth allows you to make a color image smoother by enhancing connection in the axial direction. For adjusting the smooth, see "Smooth" on page 6-29.

Color Map

Color Map allows you to change the color map used for Color Flow mode and Power Doppler mode. Color map values are 0 to 28. For adjusting the color map, see "Color Map" on page 6-29.

Ensemble

Ensemble allows you to select the density of the scan line. With increasing the number of ensemble, the frame rate decreases. For adjusting the ensemble, see "Ensemble" on page 6-30.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 6-30.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging. For adjusting the persistence, see "Persist" on page 6-15.

Wall Filter

Wall Filter filters out clutter signals caused from vessel movement. For adjusting the wall filter, see "Wall Filter" on page 6-30.

Threshold

Threshold assigns the grayscale level at which color information stops. For adjusting the threshold, see "Threshold" on page 6-31.

Micro Vascular Imaging (MVI)

Smaller vessels can be imaged using Micro Vascular Imaging (MVI), which is optimized for visualization of low velocity and small diameter blood vessels. MVI is used to detect and visualize micro-vasculature by providing higher sensitivity and higher spatial resolution.

Transducer Compatibility

Micro Vascular Imaging (MVI) is available on Convex, Volume Convex and Linear transducers. The transducers that support the Micro Vascular Imaging are as follows:

- Convex: SC1-7H, SC2-9H
- Volume Convex: SVC1-8H
- Endocavity: EC2-11H, EV2-11H
- Linear: L3-12X, L10-25H, SL3-19H, SL3-19X, L3-8H, L3-15H

MVI Mode Display

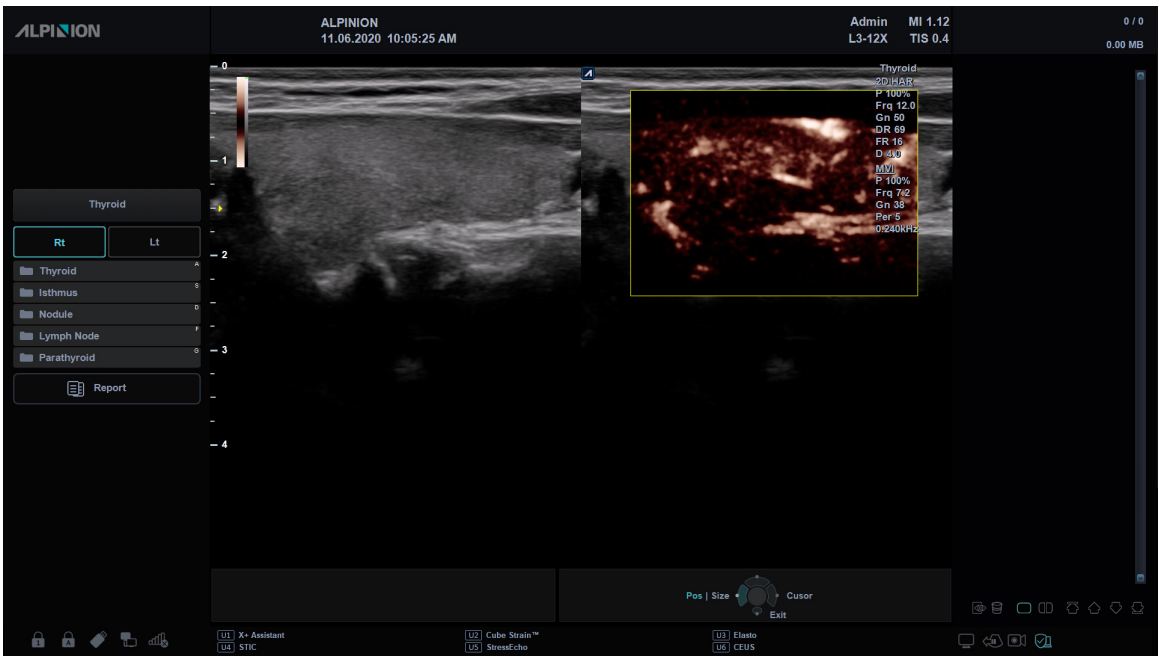


Figure 6-13 Micro Vascular Imaging (MVI) Display

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

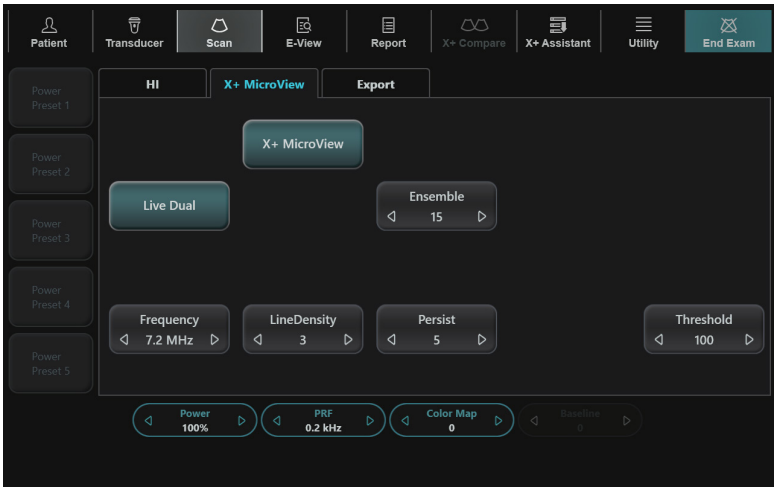


Figure 6-14 MVI Mode Touch Screen

General Workflow

To perform an examination using MVI mode,

1. In CF mode, select **PD** on the touch screen.
   PD mode is activated.
2. Select **X+ MicroView** on the touch screen.
   Micro Vascular Imaging (MVI) is activated.
3. To deactivate Micro Vascular Imaging (MVI), select **X+ MicroView** on the touch screen.

Pulsed Wave Doppler (PWD) Mode

Pulsed Wave Doppler (PWD) is a Doppler mode that measures velocity in a PW sample volume and displays that information in a spectral trace with an audio output.

Doppler is intended to provide measurement data concerning the velocity of moving tissues and fluids. PW Doppler lets you examine the blood flow data selectively from a small region called the sample volume.

Doppler equipment is commonly used for detecting and evaluating the blood flow in arteries and veins. The Doppler effect is used in medical ultrasound to detect moving reflectors and to measure and characterize the blood flow.

PWD Mode Display

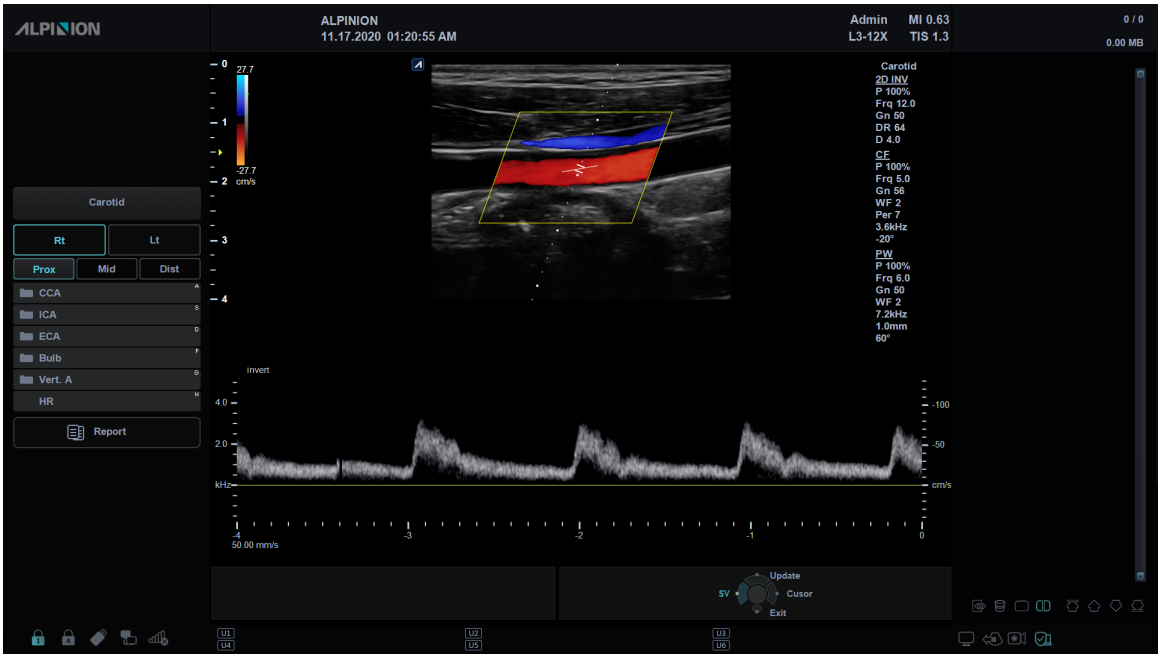


Figure 6-15 PWD Mode Display

General Workflow

To perform an examination using PWD mode,

1. In 2D mode, press the **[PW]** key on the control panel.
2. Adjust the position and the size of the sample volume.
3. To change the sample volume size, select **SV** on the touch screen.
4. To adjust the angle-to-flow correction, rotate the **[Angle]** key on the control panel.
5. To change the sweep speed, select **Sweep** on the touch screen.
6. To exit PW Doppler mode, press the **[PW]** or **[2D]** key.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

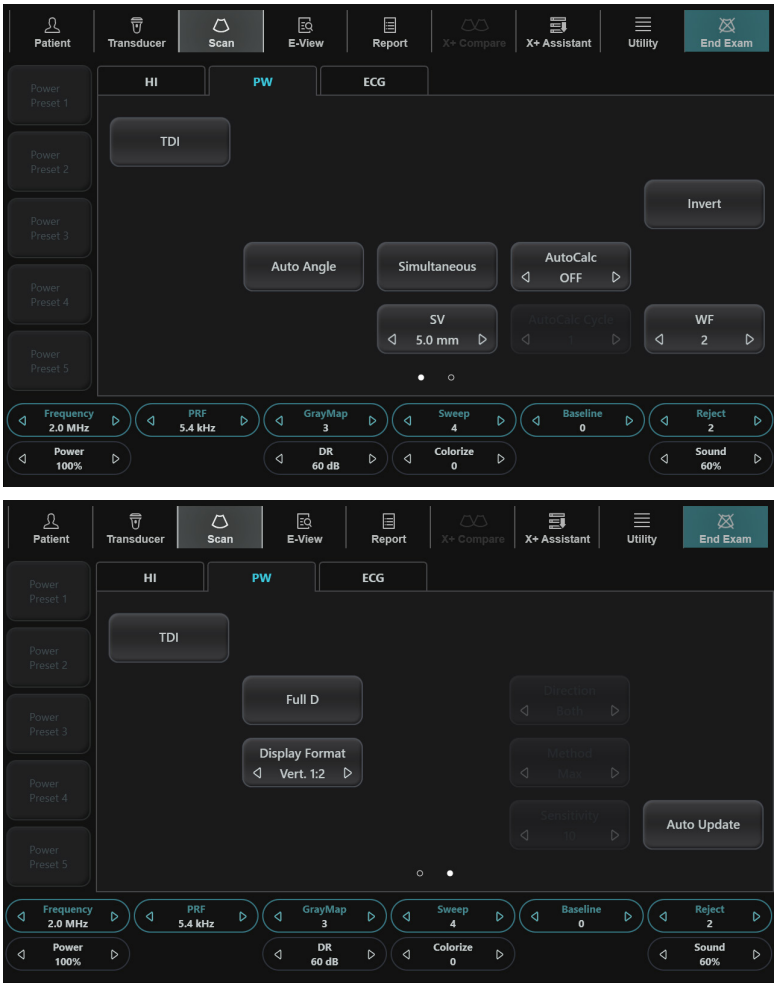


Figure 6-16 PWD Mode Touch Screen

PW Doppler angle

Angle between the direction of reflector motion and the direction of propagation of the ultrasound beam.

PW Doppler effect

Phenomenon whereby there is a change in the perceived frequency of a sound source relative to the transmitted frequency when there is a relative motion between a sound source and the listener.

Angle Correct

Estimate the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured.

NOTE

When the Doppler mode cursor and angle correct indicator are aligned (the angle is 0), you cannot see the angle correct indicator.

Adjusting Aangle Correct

Flow toward the transducer is mapped above the baseline and vice versa.

To adjust the angle relative to the transducer face, rotate the **[Angle]** key on the control panel. The velocity scale changes when you adjust angle correct.

Angle Correct values

Angle Correct values are -89 to 89.

Auto Angle

Auto Angle allows you to adjust the angle by 60 degrees.

Adjusting Auto Angle

To adjust the PW Doppler angle, select **Auto Angle** on the touch screen.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Auto Angle values

Auto Angle values are -60, 0, and 60.

Simultaneous

In simultaneous mode of 2D and Doppler modes, you can pause a Doppler image and move the image to the 2D live screen by adjusting the Doppler gate.

Activating the simultaneous mode

To activate or deactivate the simultaneous mode, select **Simultaneous** on the touch screen.

Simultaneous values

Simultaneous values are On and Off.

Invert

Invert vertically inverts the spectral trace without affecting the baseline position.

Activating Invert

To invert the spectral trace, select **Invert** on the touch screen. The plus (+) and minus (-) signs on the velocity scale are reversed when the spectrum is inverted. Positive velocities display below the baseline.

Invert values

Invert values are On and Off.

Full Timeline

Full Timeline allows you to expand the display in full timeline.

Activating Full Timeline

To expand the display in full timeline, select **Full D** on the touch screen.

Full Timeline values

Full Timeline values are On and Off.

Auto Update

When the Doppler mode cursor on the 2D-mode image moves, 2D image is updated.

Activating Auto Update

To activate Auto Update, select **Auto Update** on the touch screen.

Auto Update values

Auto Update values are On and Off.

Doppler sample volume length

Size the sample volume gate.

Adjusting the sample volume length

To increase or decrease the gate size, select **<** or **>** of **SV** on the touch screen. You can adjust the sample volume gate length whenever the sample volume gate appears on the display.

NOTE

Adjustments to the sample volume gate size are made from the center point of the sample volume position.

Sample volume length values

Sample volume length values may vary depending on the transducer and application. Sample volume gate size values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

AutoCalc

Activate the calculation automatically when the AutoCalc is in Frozen or Live.

Adjusting AutoCalc

To adjust the AutoCalc, select **<** or **>** of **AutoCalc** on the touch screen.

AutoCalc values

AutoCalc values are OFF, Frozen, and Live.

AutoCalc Cycle

AutoCalc Cycle is used to adjust the number of cycles.

Adjusting the AutoCalc Cycle

To adjust the AutoCalc Cycle, select **<** or **>** of **AutoCalc Cycle** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

AutoCalc Cycle values

AutoCalc Cycle values are 1 to 5.

Wall Filter

Wall Filter filters out clutter signals caused from vessel movement.

Adjusting the wall filter

To raise or lower the wall filter, select **<** or **>** of **WF** on the touch screen.

Wall Filter values

Wall Filter values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change the following: Transducer, application, new patient.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed.

Adjusting the display format

To adjust the display format, select **<** or **>** of **Display Format** on the touch screen.

NOTE

This function can not be adjusted when Full D is activated.

Display Format values

Display Format values are as follows: Vert. 1:1, Vert. 1:2, Vert. 2:1, Horiz. 1:1, Horiz. 1:2, Horiz. 2:1.

Angle Steer

Angle Steer tilts the sample volume for the Doppler spectrum. This function is only for linear transducers.

Adjusting Angle Steer

To adjust the angle steer, select **<** or **>** of **Angle Steer** on the touch screen. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when Virtual Convex is applied to the current image.

Angle Steer values

Angle Steer values are -20, -15, -10, 0, 10, 15, and 20.

Direction

Direction is used to specify the part of the spectrum to calculate when using AutoCalc.

Adjusting the direction

To adjust Direction, select **<** or **>** of **Direction** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Direction values

Direction values are Both, Below, and Above.

Method

Method is used to trace the average mean and peak velocities in realtime or frozen images.

Adjusting Method

To adjust Method, select **<** or **>** of **Method** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Method values

Method values are Max, Mean, and Both.

Sensitivity

Sensitivity is used to adjust the trace to follow the waveform for signal strength.

Adjusting Sensitivity

To adjust Sensitivity, select **<** or **>** of **Sensitivity** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Sensitivity values

Sensitivity values are -10 to 10.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 6-13.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 6-15.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 6-29.

HPRF (High Pulse Repetition Frequency)

High Pulse Repetition Frequency (HPRF) is a special operating mode of PW Doppler. HPRF function is used when detected velocities exceed the processing capabilities of the currently selected PW Doppler scale, or when the selected anatomical site is too deep for the selected PW Doppler scale.

Activating HPRF (High PRF)

The system automatically switches to HPRF mode when the velocity scale factor or sample volume gate depth exceeds certain limits. When HPRF function is activate, multiple sample volume gates appear on the Doppler mode cursor.

NOTE

To set the system automatically switch to HPRF mode, go to **Utility** > **Setup** > **ImagePreset** > **General** and select the **HPRF Enable** check box.

Remarks

Make sure that more than two sample volume gates are not located in a blood vessel. If the sample volume gates are placed together in the same area, all Doppler signals appear in the spectrum, causing noise.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 6-14.

Dynamic Range

Dynamic Range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 6-13.

Sweep Speed

Sweep Speed allows you to adjust the sweep speed of the Doppler spectrum.

Adjusting Sweep Speed

To increase or decrease the sweep speed, rotate the **Sweep** soft key clockwise or counter-clockwise.

Sweep Speed values

Sweep Speed values are 0 to 10.

Remarks

You can speed up or slow down the timeline to see more or fewer occurrences over time.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 6-14.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 6-30.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 6-14.

Sound

Sound adjusts the Doppler sound volume.

CAUTION

Doppler audio sounds may change abruptly. Adjust the volume of sound in smaller increments to avoid startling the patient.

Adjusting Sound

To adjust Sound, rotate the **Sound** soft key clockwise or counter-clockwise.

Sound values

Sound values are 0 to 100.

Remarks

Audio sounds of the blood flow in a vessel can be used to check the proper position of the transducer.

Continuous Wave Doppler (CWD) Mode

Continuous Wave Doppler (CWD) mode allows you to view the velocity and direction of a blood flow at a certain position. As you move the Doppler cursor, images on the Doppler line appear by time order. For using this feature, you need an additional request to your local agent. It also requires CWD mode-supported transducers such as a phased array transducer or Doppler pencil transducer.

CWD Mode Display

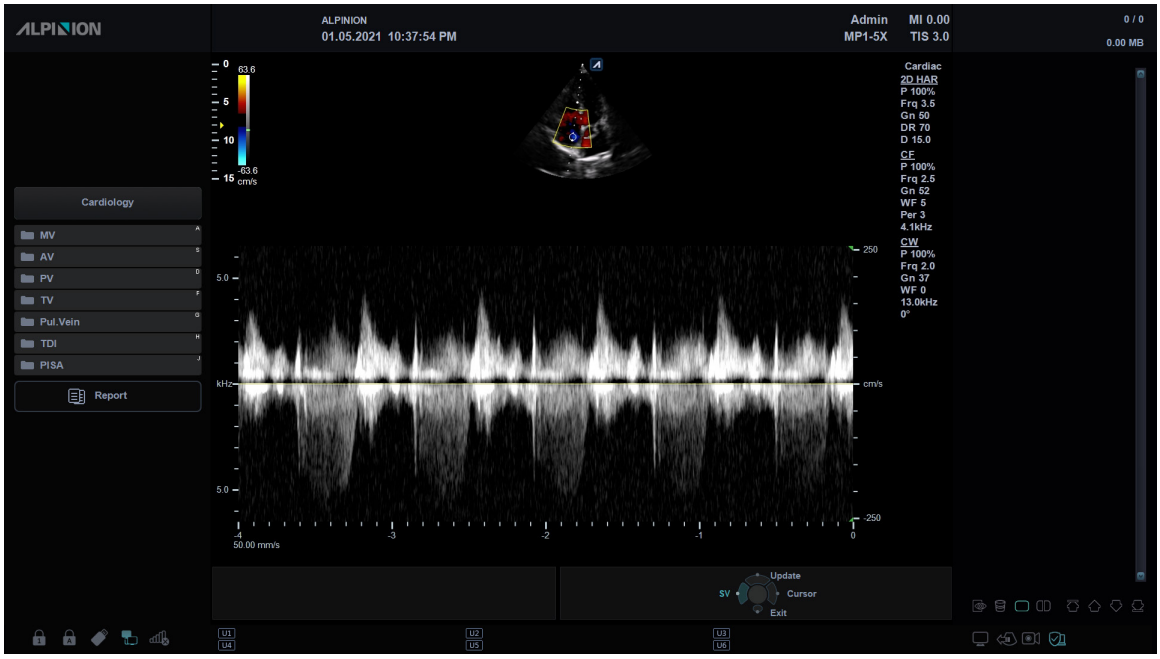


Figure 6-17 CWD Mode Display

General Workflow

To perform an examination using CWD mode,

1. Make sure that the dedicated transducer is connected to your system.
2. In 2D mode, press the **[CW]** key on the control panel.
   When a CWD transducer is connected to your system, CWD mode is automatically activated.
3. To adjust the angle-to-flow correction, rotate the **[Angle]** key on the control panel.
4. To change the sweep speed, select **Sweep** on the touch screen.
5. To exit CWD mode, press the **[CW]** or **[2D]** key.

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

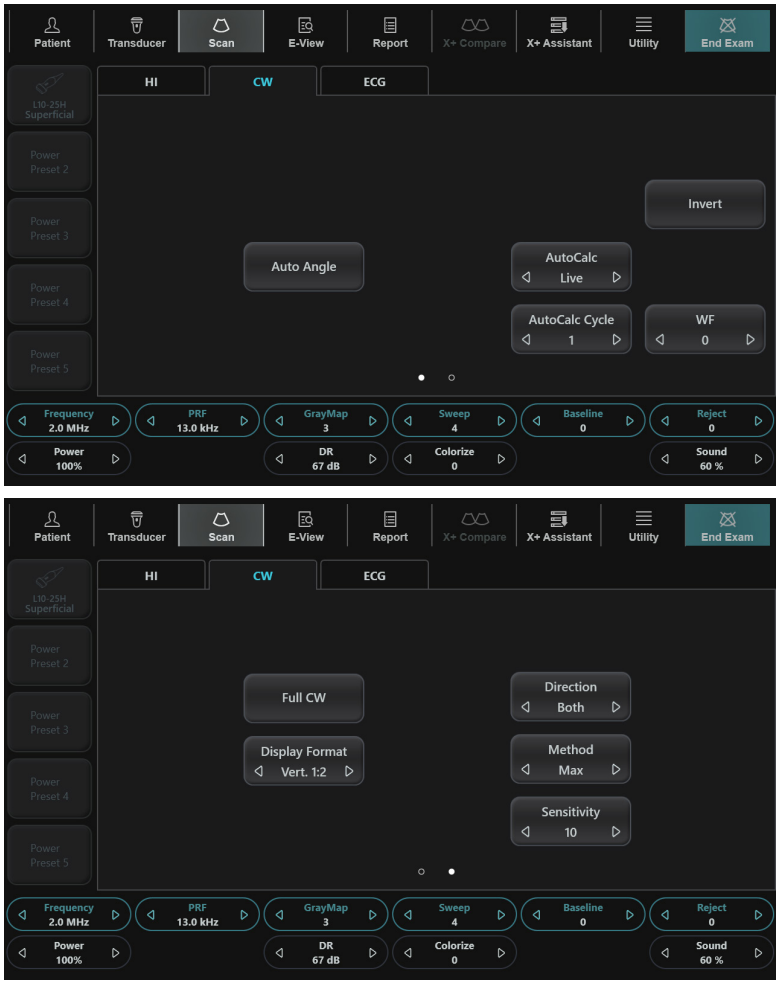


Figure 6-18 CWD Mode Touch Screen

Angle Correct

Estimate the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured.

NOTE

When the Doppler mode cursor and angle correct indicator are aligned (the angle is 0), you cannot see the angle correct indicator.

Adjusting Angle Correct

Flow toward the transducer is mapped above the baseline and vice versa. To adjust the angle relative to the transducer face, rotate the **[Angle]** key on the control panel. The velocity scale changes when you adjust angle correct.

Angle Correct values

Angle Correct values are -89 to 89.

Auto Angle

Auto Angle allows you to adjust the angle by 60 degrees. For activating or deactivating Auto Angle, see "Auto Angle" on page 6-43.

Invert

Invert vertically inverts the spectral trace without affecting the baseline position. For activating or deactivating Invert, see "Invert" on page 6-44.

Full Timeline

Full Timeline allows you to expand the display in full timeline.

Activating the full timeline

To expand the display in full timeline, select **Full CW** on the touch screen.

Full Timeline values

Full Timeline values are On and Off.

AutoCalc

Activate the calculation automatically when the AutoCalc is in Frozen or Live. For adjusting the AutoCalc, see "AutoCalc" on page 6-45.

AutoCalc Cycle

AutoCalc Cycle is used to adjust the number of cycles. For adjusting the AutoCalc Cycle, see "AutoCalc Cycle" on page 6-45.

Direction

Direction is used to specify the part of the spectrum to calculate when using AutoCalc. For adjusting the direction, see "Direction" on page 6-46.

Method

Method is used to trace the average mean and peak velocities in realtime or frozen images. For adjusting the method, see "Method" on page 6-46.

Sensitivity

Sensitivity is used to adjust the trace to follow the waveform for signal strength. For adjusting the sensitivity, see "Sensitivity" on page 6-47.

Wall Filter

Wall Filter filters out clutter signals caused from vessel movement. For adjusting the wall filter, see "Wall Filter" on page 6-45.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed. For adjusting the display format, see "Display Format" on page 6-45.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 6-13.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 6-15.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 6-29.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 6-14.

Dynamic Range

Dynamic Range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 6-13.

Sweep Speed

Sweep Speed allows you to adjust the sweep speed of the Doppler spectrum. For adjusting the sweep speed, see "Sweep Speed" on page 6-48.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 6-14.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 6-30.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 6-14.

Sound

Sound adjusts the Doppler sound volume. For adjusting the sound, see "Sound" on page 6-49.

Tissue Doppler Imaging (TDI) Mode

Tissue Doppler Imaging (TDI) mode allows you to view the status of the myocardium by measuring the velocity of the tissue movement on the Doppler image. This mode only is available for adult cardiac application.

The combination imaging modes of TDI mode

The following combination imaging modes are available:

- PW tissue Doppler
- Color 2D tissue Doppler

TDI Mode Display

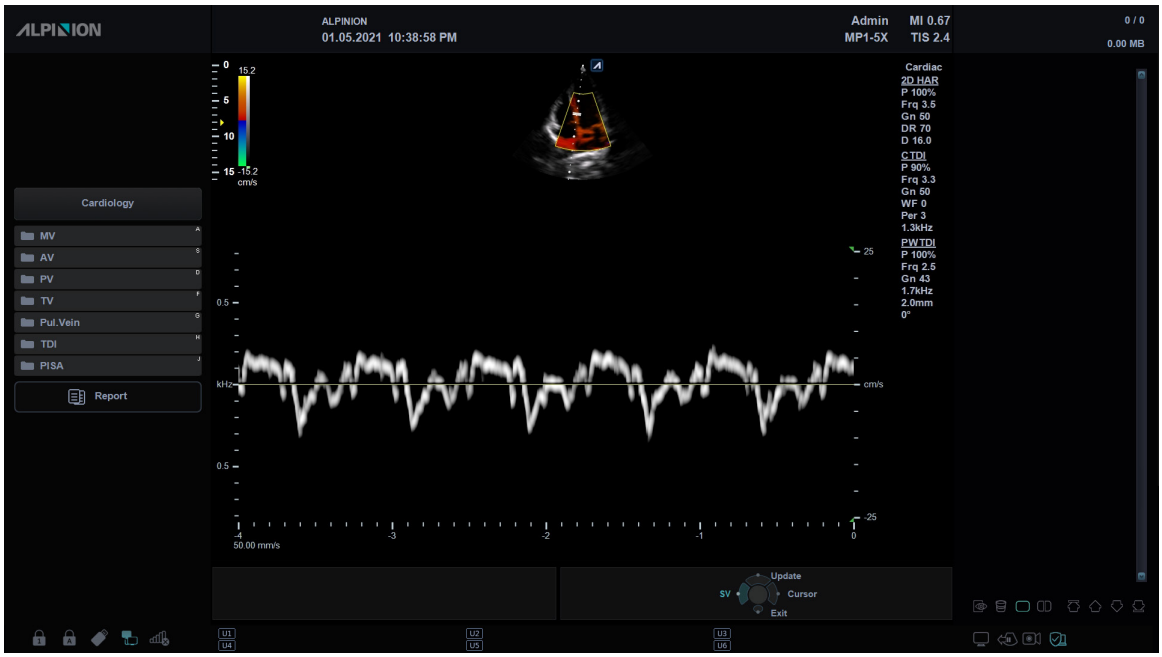


Figure 6-19 TDI Mode Display

Image Optimization Controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

Figure 6-20 TDI Mode Touch Screen

General Workflow

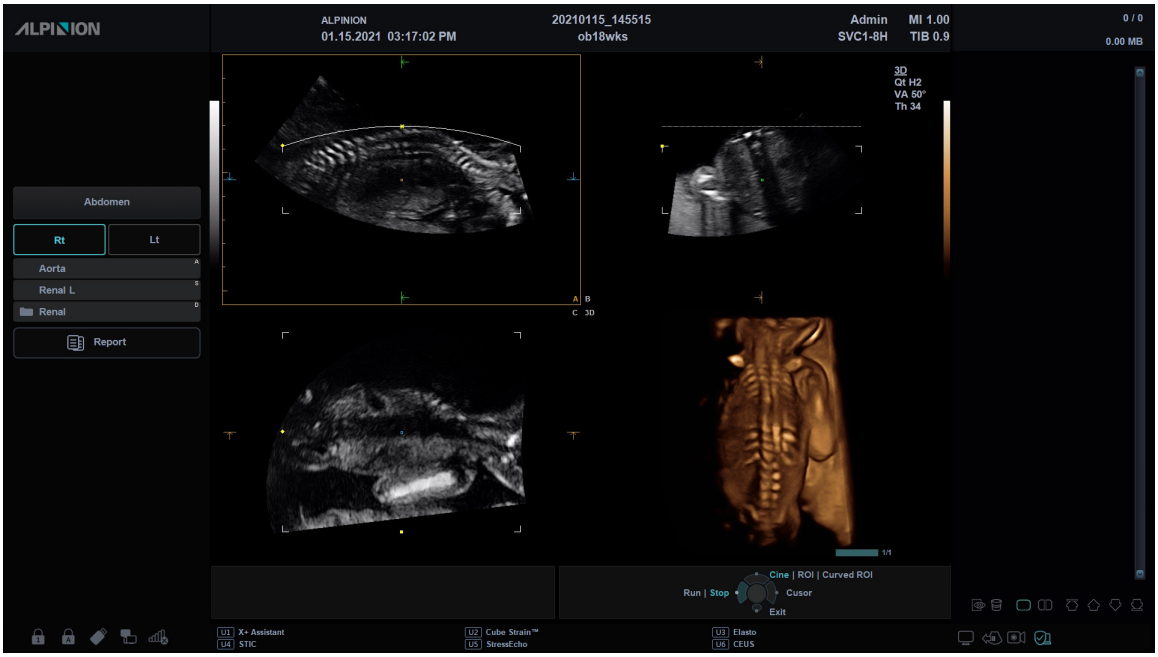
To perform an examination using TDI mode,

1. In 2D mode, press the **[CF]** Key on the control panel. CF mode is activated.
2. Select **TDI** on the touch screen.
   Color 2D tissue Doppler mode is activated.
3. To activate PW tissue Doppler mode, press the **[PW]** key.
4. To exit TDI mode, select **TDI** on the touch screen.

3D/4D Modes

3D/4D imaging modes are useful for imaging structures that cannot be obtained in 2D mode for better understanding of complex structures.

Example of fetal face in multiplanar sections and surface rendering.



The following table describes 3D and 4D modes:

Mode	Description
3D	Reconstruct 3D image with obtained one volume image.
4D	Obtain the 3D volume data on real time and rendering this.

NOTE

- 3D/4D imaging modes are optional that you need to request additionally. If this mode is not available, the 3D and 4D menus on the touch screen are deactivated.
- Standard transducers cannot be used for 3D/4D modes. Only SVC1-8H and VE3-10H support 3D/4D modes.

Available Features in 3D/4D Modes

The following features are available in 3D/4D modes:

- Most of 2D controls
- Text and Arrow
- Measurement

The following post-processing controls are available in 3D/4D modes:

- Zoom
- Cine (Only for 4D mode)

Volume Setup

Operational controls for 3D/4D modes

The following table describes the key functions in 3D/4D modes.

Table 6-1 3D/4D operational controls

Control	Description
Freeze	In 3D/4D setup mode, press to obtain a 3D or 4D image. In 3D mode, press to switch to 3D/4D setup mode. In 4D mode, press to switch to 3D mode. Press again to return to 4D mode.
Angle	In 3D or 4D mode, rotate along the X axis; up and down rotation.
PW	In 3D or 4D mode, rotate along the Y axis; left and right rotation.
CF	In 3D or 4D mode, rotate along the Z axis; clockwise and counter-clockwise rotation.
M/Depth	In 3D or 4D mode, move parallel. • **PlaneA**: Left/Right • **PlaneB**: Up/Down • **PlaneC** or **3D**: Forward/Backward
Single	Show a 3D image.
Dual	Show one reference image and one 3D image.
Quad	Show three reference images and one 3D image.
Priority Set/Cur	While or after acquiring the volume data, press to change the function. The activated function is shown on the bottom right of the display: • **Priority:** Cine, Cine Calc., Move, ROI, Curved ROI, Line1,2,3, Light Direction • **Set**: Run and Stop (Cine or Cine Calc.), Image and Axis (Move), Pos and Size (ROI), Initial (Curved ROI), Pos and Rot (Line1,2,3) • **Cursor**: Cursor (Display remains blank.)
Trackball	Adjust the position, light direction, and the size of the ROI. When the **[Priority]** key is pressed, use to perform the activated function: • **Cine** or **Cine Calc.**: Use to move the cine frame. • **Move**: Use to move the image. • **ROI**: Use to adjust the clipping box size of ROI. • **Curved ROI**: Use to change the contour of the clipping line. • **Cursor**: Use to move the cursor to the desired location. • **Light Direction**: Use to change Light Direction in LiveHQ.

Volume Acquisition

Setting up for volume acquisition

You can optimize the image and select settings for the volume acquisition by using the following imaging parameters.

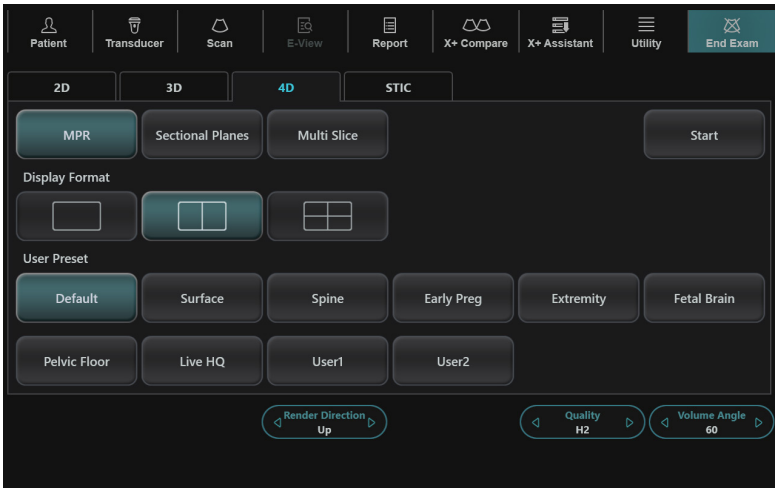


Figure 6-21 Imaging Parameters for Volume Acquisition (3D/4D)

Table 6-2 Volume acquisition parameters

Preset Parameter	Description
View Types	MPR, Sectional Planes, Multi Slice
Display Format	Change the display layout. • **1**: One rendered volume image • **2**: One rendered volume image and one slice image • **4**: One rendered volume image and three slice images
User Preset	Show the user preset values such as surface and spine.
Render Direction	Adjust the view direction of the ROI.
Quality	Change the line density to adjust image quality and acquisition time. • **Low**: Low quality and fast acquisition time • **Mid**: Better quality but slower acquisition time than the low quality • **H1**: Better quality but slower acquisition time than the medium quality • **H2**: Best quality and the slowest acquisition time
Volume Angle	Set the range of the volume sweep. The range of angle varies depending on the transducer in use. • Volume Convex: 15, 30, 45, 60, 75 • Volume Endocavity: 10, 30, 45, 60, 75, 90, 105, 120

NOTE

The imaging parameters are returned to their factory values when you change the transducer.

Region of Interest (ROI) and Rendering Box

After the system enters 3D/4D imaging mode, a 2D image with ROI displays on the screen. A line that shows the upper edge position of VOI is inside ROI.

The render box determines the size of the volume to be rendered. Therefore, objects that are not inside the box will not be included in the render process and cut out.

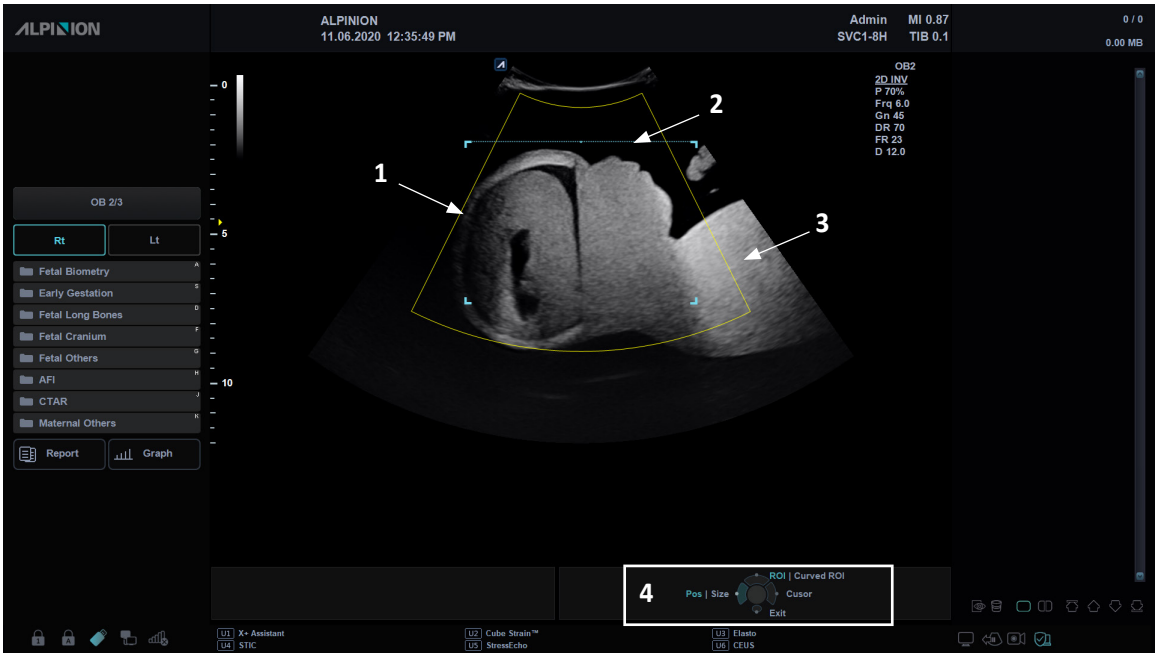


Figure 6-22 Region of Interest (ROI)

1	Region of Interest (ROI)	**3**	2D image
2	Rendering Box (Cut plane)	**4**	Trackball controls and status

To adjust the ROI of the display,

1. Obtain a 2D image and optimize the image for the best quality.
2. If necessary, obtain a CF image and optimize the image for the best quality.
3. Press the **[3D/4D]** key on the control panel.
4. Touch the **3D** or **4D** tab on the touch screen.
   The yellow-colored ROI appears on the display.
5. Use **[Trackball]** to move the ROI to the desired position.
6. Press the **[Set]** key set the trackball to **Size**.
7. Use **[Trackball]** to adjust the size of the ROI.
8. Press the **[Priority]** key set the trackball to **Curved ROI**.
9. Use **[Trackball]** to adjust the line of the Curved ROI.
10. If necessary, press the **[Set]** key to set the trackball to **Initial** to reset the curved line to a straight line.

Acquiring a 3D image

To acquire a 3D image,

1. Connect the appropriate 3D/4D-compatible transducer.
2. Touch **Transducer** on the touch screen and select a transducer and preset.
3. Obtain a 2D image and optimize the image for the best quality.
4. Press the **[3D/4D]** key on the control panel.
5. Touch the **3D** tab on the touch screen.
   The yellow-colored ROI and soft menus for 3D mode appear.
6. Define the Volume of Interest (VOI) to be scanned.
   Use **[Trackball]** to move the VOI and press the **[Priority]** key to re-size and re-position the VOI.
   Only the area defined within the VOI is rendered.
7. Select one of the preset settings for data acquisition and display.
8. Rotate the **Volume Angle** soft key to set the transducer scanning angle.
9. Rotate the **Quality** soft key to adjust image quality and acquisition time.
10. Rotate the **Render Direction** soft key to change the direction of the image view.
11. Select the desired display format on the touch screen to change the display layout.
12. Select one of the preset settings for data acquisition and display.
13. To start acquiring the image, select **Start** on the touch screen to acquire the image data.
    Or, you can also press the **[Freeze]** key on the control panel.
14. After you acquire the volume data, the 3D mode screen appears.

NOTE

If the image stops during scanning an image, start acquiring the 3D volume of interest again.

Acquiring a 3D Color image

To acquire a 3D Color image,

1. Connect the appropriate 3D/4D-compatible transducer.
2. Touch **Transducer** on the touch screen and select a transducer and preset.
3. Obtain a 2D image and optimize the image for the best quality.
4. Press the **[CF]** key on the control panel to activate Color Flow.
5. Press the **[3D/4D]** key on the control panel.
6. Touch the **3D** tab on the touch screen.
   The yellow-colored ROI and soft menus for 3D mode appear.
7. Define the Volume of Interest (VOI) to be scanned.
   Use **[Trackball]** to move the VOI and press the **[Priority]** key to re-size and re-position the VOI.
   Only the area defined within the VOI is rendered.
8. Select one of the preset settings for data acquisition and display.
9. Rotate the **Volume Angle** soft key to set the transducer scanning angle.
10. Rotate the **Quality** soft key to adjust image quality and acquisition time.
11. Rotate the **Render Direction** soft key to change the direction of the image view.
12. Select the desired display format on the touch screen to change the display layout.
13. Select one of the preset settings for data acquisition and display.
14. To start acquiring the image, select **Start** on the touch screen to acquire the image data.
    Or, you can also press the **[Freeze]** key on the control panel.
15. After you acquire the volume data, the 3D Color mode screen appears.

NOTE

If the image stops during scanning an image, start acquiring the 3D volume of interest again.

Acquiring a 4D image

To acquire a 4D image,

1. Connect the appropriate 3D/4D-compatible transducer.
2. Touch **Transducer** on the touch screen and select a transducer and preset.
3. Obtain a 2D image and optimize the image for the best quality.
4. Press the **[3D/4D]** key on the control panel.
5. Touch the **4D** tab on the touch screen.
   The yellow-colored ROI and soft menus for 4D mode appear.
6. Define the Volume of Interest (VOI) to be scanned.
   Use **[Trackball]** to move the VOI and press the **[Priority]** key to re-size and re-position the VOI.
   Only the area defined within the VOI is rendered.
7. Select one of the preset settings for data acquisition and display.
8. Rotate the **Volume Angle** soft key to set the transducer scanning angle.
9. Rotate the **Quality** soft key to adjust image quality and acquisition time.
10. Rotate the **Render Direction** soft key to change the direction of the image view.
11. Select the desired display format on the touch screen to change the display layout.
12. To start acquiring the image, select **Start** on the touch screen to acquire the image data.
    Or, you can also press the **[Freeze]** key on the control panel.
13. After you acquire the volume data, the 4D mode screen appears.
14. To magnify the volume, rotate the **[Zoom]** key on the control panel.

NOTE

If the image stops during scanning an image, start acquiring the 3D volume of interest again.

Changing the view type

You can change the view type after acquiring volume data by selecting a view type menu.

To change view type,

– Select a view type (**MPR**, **Sectional Planes** or **Multi Slice**) on the touch screen.

– Touch the desired view type (**MPR**, **Sectional Planes** or **Multi Slice**) tab on the touch screen.

Volume Visualization

Changing the view type

You can change the view type after acquiring volume data by selecting a view type menu.

To change view type,

– Select a view type (**MPR**, **Sectional Planes** or **Multi Slice**) on the touch screen.

– Touch the desired view type (**MPR**, **Sectional Planes** or **Multi Slice**) tab on the touch screen.

MPR (Multi-Planar Rendering)

MPR (Multi Planar Rendering) shows a single volume data. The system automatically displays the volume and MPRs during the 4D imaging volume acquisition, after the 3D volume acquisition, or during the review of retrieved volumes.

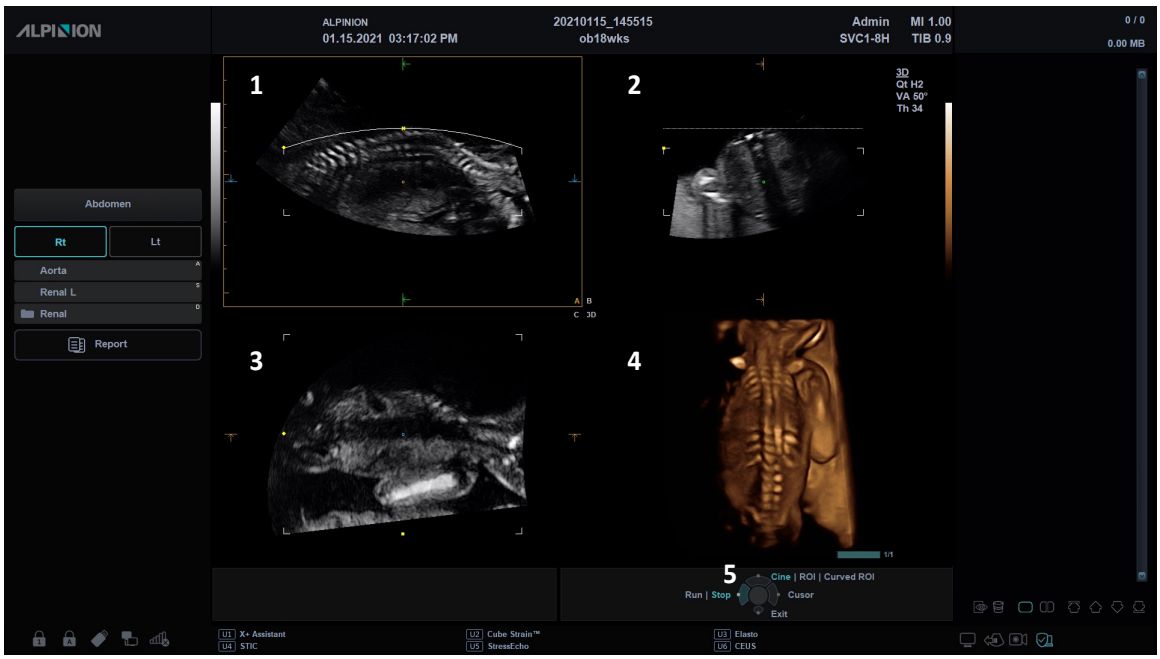


Figure 6-23 MPR Display

1	A Plane: Sagittal Plane	**4**	Volume Image
2	B Plane: Transverse Plane	**5**	Trackball controls and status
3	C Plane: Coronal Plane		

Defining Volume of Interest (VOI) and viewing planes

You can define a data to be displayed in the volume quadrant by enabling the VOI (Volume of Interest) and then resizing and repositioning the VOI in relation to the acquired volume data. The system displays the VOI in the volume and the related view plane in each orthogonal MPR.

The view plane is the side of the VOI represented by a solid or dotted line.

Changing the view line (Clipping box line) of the VOI

To adjust the VOI size,

1. Select the desired reference plane (A, B, C) on the touch screen.
   The selected plane appears on the display.
2. Press the **[Priority]** key to set the trackball to **ROI**.
3. Press the **[Set]** key to set the trackball to **Pos**.
4. Adjust the view line by using **[Trackball]**.
   The size of the volume image changes according to the view line.

Changing the volume of a plane

You can change the volume of a plane by curving the VOI.

To change the volume of a plane,

1. Press the **[Priority]** key to set the trackball to **Curved ROI**.
2. Adjust the curved line by using **[Trackball]**.
   The volume image changes according to the curved line.
3. If necessary, pres the **[Set]** key to reset the three-point curved line to a straight line.

Customizing the render settings

After acquiring the volume data, imaging parameters appear on the touch screen. Imaging parameters allow you to optimize the volume tissue components.

Figure 6-24 Rendering Parameters

The following table describes the rendering imaging parameters.

Table 6-3 Rendering parameters

Parameter	Description	
Display Format	Select the display format. • Single: The 3D image is displayed in full screen view. • Dual: One 2D image and one 3D image are displayed. • Quad: All 2D and 3D images are displayed.	
Live HQ	Activate the Live HQ imaging, and display the Live HQ menu.	
Silhouette	Adjust the Silhouette.	
Clear Face	Activate the Clear Face function. Recognize the fetal face and remove the shading obstacle data automatically.	
Easy Cut	Activate the Easy Cut function, and display the Easy Cut menu. Electronically edit images by cutting away unwanted structures on the ROI.	
Initial	Reset the current 3D or 4D settings.	
Edit ROI	Select to adjust the size of the Region of Interest (ROI).	
ColorMap	Select the desired color map.	
Render Setup	**Render setting**	For better image, be familiar with the following render settings: • **Surface**: It is possible to combine the gradient and texture shading. This is done by calculating each weighted sum of the colors derived for gradient and texture shading. • **Depth**: Superimpose the tint map on the volume image to improve the stereoscopic sensation and the contrast of the image. • **Max**: Maximum intensity projection. Represent a 3D image in maximum intensity. This option can be useful for observation of bone structure. • **Min**: Minimum intensity projection. Represents a 3D image in minimum intensity. This option can be useful for observation of vessels or cavities in the human body. • **Light, Light2**: Represent the highlight and shadow on the surface of the image. An image area close to viewer is shown bright; an image area distant from the viewer is shown shaded. • **XRay**: Represent a 3D image in average intensity. An image is shown like an X-ray image.
	Render setting (only for 3D Color)	• **Gray**: Display the gray values in the ROI. • **Color**: Display the color values in the ROI. • **Mix**: Display both gray and color values in the ROI.
	Render Direction	Adjust the direction of the image view. • **Up/Down** • **Lt/Rt** • **Front/Back**

Parameter	Description
Alpha Mode	Select the imaging preset for OB or GYN examination. • **0**: OB • **1**: GYN
Preset	Reload the presets for the selected application.
Cine	Manual selection of single volume frames.
Cine Calc.	Display the Cine Calculations menu.
3D Print	Save the 3D images on a removable media.
Ref. Plane	Select a reference image from A, B, C or 3D.
3D Orientation	Change the orientation of the image on the display.
Smooth	Adjust the smooth to apply a low-pass filter.
Brightness	Adjust the overall brightness of volume.
Opacity	Adjust the opacity to eliminate darker gray shades, background noise.
Contrast L	Adjust the contrast of the dark part of the volume image.
Contrast H	Adjust the contrast of the bright part of the volume image.
Threshold	Adjust the threshold to define structures of interest.
Transparency	Set the transparency of the 3D image.
Tissue Priority (only for 3D Color)	Adjust the mixing ratio to hide the color on the sectional planes.
3D SRI	Adjust the 3D SRI on the MPR view. Obtain a clearer image by eliminating noise and enhancing boundaries.
2D SRI	Adjust the 2D SRI on the MPR view. Obtain a clearer image by eliminating noise and enhancing boundaries.
Color Render (only for 3D Color)	Select the render setting for 3D Color. • **Gray** • **Color** • **Mix**
Ref. Slice	Move the reference slice to the left and the right in parallel.
Vol.Sync	• **On**: Rotate the MPR image and the volume image simultaneously. • **Off**: Rotate the MPR image and the volume image separately.
Quality	Change the line density to adjust image quality and acquisition time.
Volume Angle	Adjust the range of the volume sweep.
DR	Adjust the dynamic range.
Gray Map	Select the desired gray map.
2D Colorize	Colorize the 2D image.
3D Color Map	Select the desired color map.

Creating presets

Presets contain a selection of predefined rendering parameters. Thus desired combination of filter can be set at once. All of rendering settings support changing the preset.

On the touch screen, select **Define Preset**. When the ***User Preset Setting*** dialog box appears, the following options are available:

- **Default All**: Recover all user preset to default factory setting.
- **Reset**: Recover the user preset to default setting.
- **Overwrite**: Overwrite an existing preset with a new preset.
- **Rename**: Change the name of an existing preset.
- **Save**: Save the current preset.
- **Cancel**: Cancel saving the user preset.

NOTE

You can apply the preset after acquiring volume data or scanning a live image.

Cine

Cine function allows you to save and work with the acquired volume images. Depending on the memory and volume size up to volumes can be displayed. The advantage of working with 4D VolCine is that during the acquisition the user can concentrate on the acquisition itself. After acquisition you have the possibility to review and work on the acquired volumes.

NOTE

Cine may not be available in 3D mode.

Table 6-4 Cine parameters

Parameter	Description
Full Run/Stop	Start or stop the playback of the full cine clip.
Clip Run/Stop	Start or stop the playback of the selected cine clip defined by start and end volume.
Loop Mode	Selec the loop mode. • Display images from start to end • Display images from start to end and backwards
Vol.byVol.	Select cine volumes.
Start	Select the starting cine number.
End	Select the ending cine number.
Speed	Change the playback speed.

Cine Calc. (Cine Calculation)

Cine Calculation function allows the volume image to be rotated automatically according to specific orientation and customized angle. When volume acquisition is paused, you can review the volume data in Cine mode.

To get an overall 3D impression of the rendered object a certain number of calculated views are displayed in a sequence. The rendered object rotates or moves in front of the observer.

Table 6-5 Cine Calc. parameters

Parameter	Description
Rot Axis	Define the axis the image is rotated around to create the cine sequence.
Rotate Angle	Define the amount of rotation of the whole cine sequence.
Step Angle	Define the amount of rotation between adjoining 3D images.
Calculate Cine Seq.	Start the calculation of the cine sequence.

Easy Cut

Easy Cut allows you to electronically edit images by cutting away unwanted structures on the ROI.

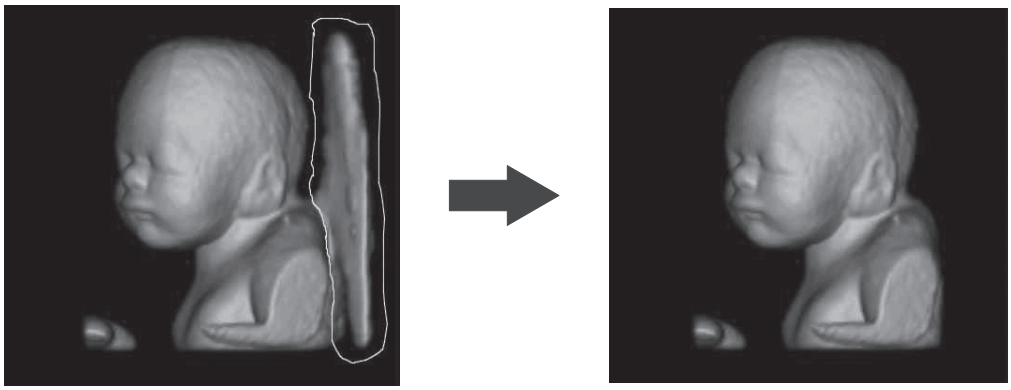


Figure 6-25 Easy Cut

Easy Cut Parameters

The following Easy Cut parameters are available:

Table 6-6 Easy Cut parameters

Parameter	Description
Trace Inside	Structures within the contour will be discarded.
Trace Outside	Structures outside the contour will be discarded.
Box in	All information inside the box will be cut.
Box out	All information outside the box will be cut.
Elipse In	Content inside the elipse will be cut.
Elipse Out	Content outside the elipse will be cut.
Eraser Small	All information inside the small circle will be cut.
Eraser Medium	All information inside the medium circle will be cut.
Eraser Large	All information inside the large circle will be cut.
Depth	Adjust the depth to cut.
Cut Type (only for 3D Color)	Select the cut type for 3D Color mode. • **Gray**: All gray information inside the circle will be cut. • **Color**: All color information inside the circle will be cut. • **Both**: All gray and color information inside the circle will be cut.
Undo/Redo	Select to undo or redo.
Redo All	Select to redo all.
Remove All	Select to remove all.

Easy Cut Workflow

To operate Easy Cut,

1. Select **MPR** on the touch screen.
2. Select **Easy Cut** on the touch screen.
3. Select the desired Easy Cut parameters and press the **[Set]** key to start.
4. Use **[Trackball]** to define the region, and then press the **[Set]** key again to cut the image. The portion is removed.
5. If necessary, select **Undo** to undo the last cut.

Live HQ

Live HQ is used to create a realistic volume rendering image using the virtual light source.

This function is turned on or off by selecting **Live HQ** on the touch screen.

Figure 6-26 Live HQ Display

Figure 6-27 Live HQ Parameters

Live HQ Parameters

The following Live HQ parameters are available:

Table 6-7 Live HQ parameters

Parameter	Description
Live HQ	This function enables you to represent a realistic live image. • **On**: Apply the Live HQ preset. • **Off**: Apply the previous preset.
Light Direction	Adjust the direction of the light for the Live HQ function. Move **[Trackball]** to adjust the direction of the light.
Render Direction	Adjust the direction of the image view.
Front Scale	Adjust the front depth scale of the Live HQ function.
Back Scale	Adjust the back depth scale of the Live HQ function.
HQ Scatter	Adjust scattering for the Live HQ function.
3D Color Map	Select the desired color map.

Live HQ Workflow

To operate Live HQ,

1. Select **MPR** on the touch screen.
2. Select **Live HQ** on the touch screen.
3. Select **Render Setup** on the touch screen. The Live HQ Render Setup menus appear on the touch screen.
4. Adjust the Live HQ image by using the Live HQ parameters.
5. Adjust the direction of the light by using **[Trackball]**.

Clear Face

The Clear Face function allows you to easily separate solid tissue in front of the fetal face.

This function is turned on or off by selecting **Clear Face** on the touch screen.

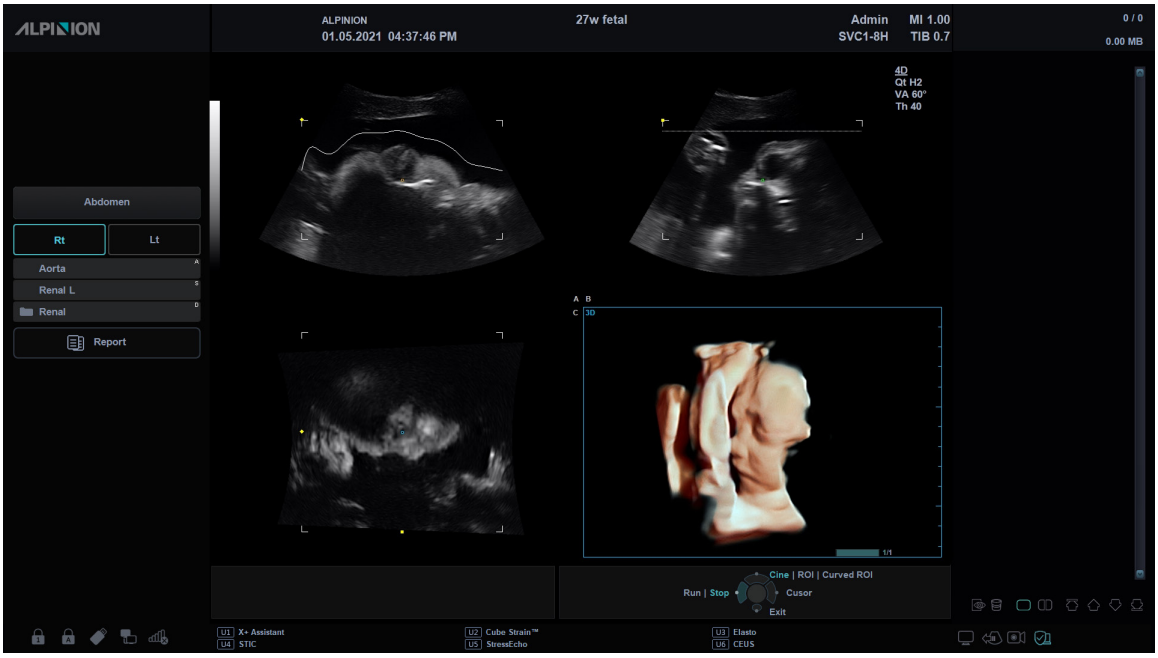


Figure 6-28 Clear Face Display

Silhouette

The Silhouette function allows you to clearly outline the structure of interest and simultaneously display the inner core and structure.

This function is turned on or off by selecting **Silhouette** on the touch screen.

Figure 6-29 Silhouette Display

Silhouette Parameters

The following Silhouette parameters are available:

Table 6-8 Silhouette parameters

Parameter	Description
Silhouette 1, 2	Select the Silhouette imaging mode.
Mix	Adjust the transparency of the image.
Level	Adjust the level of the transparency of the image.

Silhouette Workflow

To operate Silhouette function,

1. Select **MPR** on the touch screen.
2. Select **Silhouette** on the touch screen.
3. Select **Render Setup** on the touch screen.
   The Silhouette Render Setup menus appear on the touch screen.
4. Adjust the Silhouette image by using the Silhouette parameters.

Sectional Planes

Sectional planes represent three different planes of the same 3D volume. There are three separate planes, A (Longitudinal), B (Transverse) and C (Coronal).

Sectional Planes supports following view types: Multi Plane, AnySlice, and Cubic View.

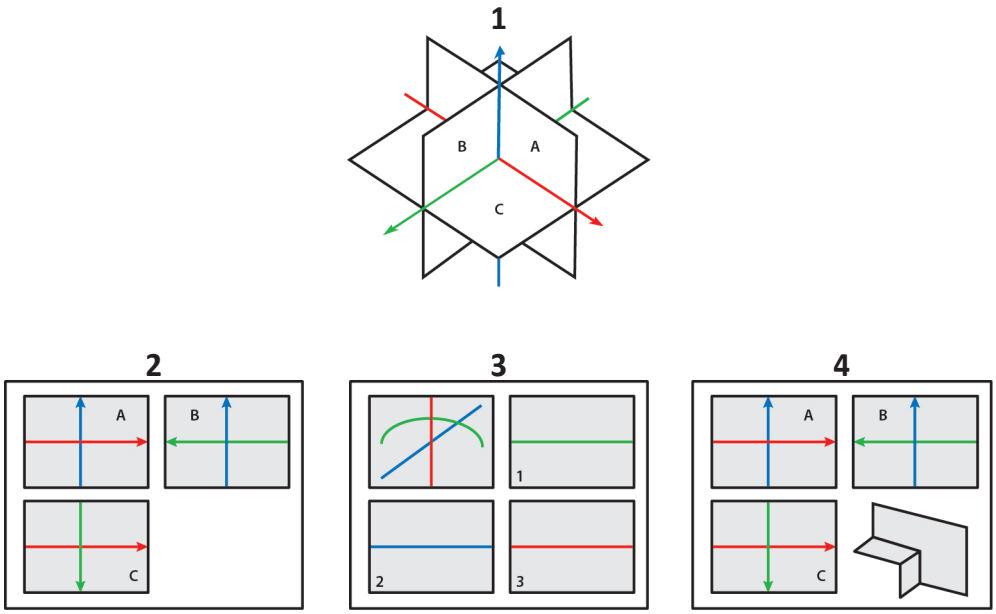


Figure 6-30 Sectional Planes display

1	Sectional Planes	**3**	AnySlice
2	Multi Plane	**4**	Cubic View

Multi Plane

Multi Plane provides three separate views of the same image: Longitudinal, Transverse, and Coronal. It supports the Cine Calc. to review the sliced images.

NOTE

The volume data is not displayed in Multi Plane mode.

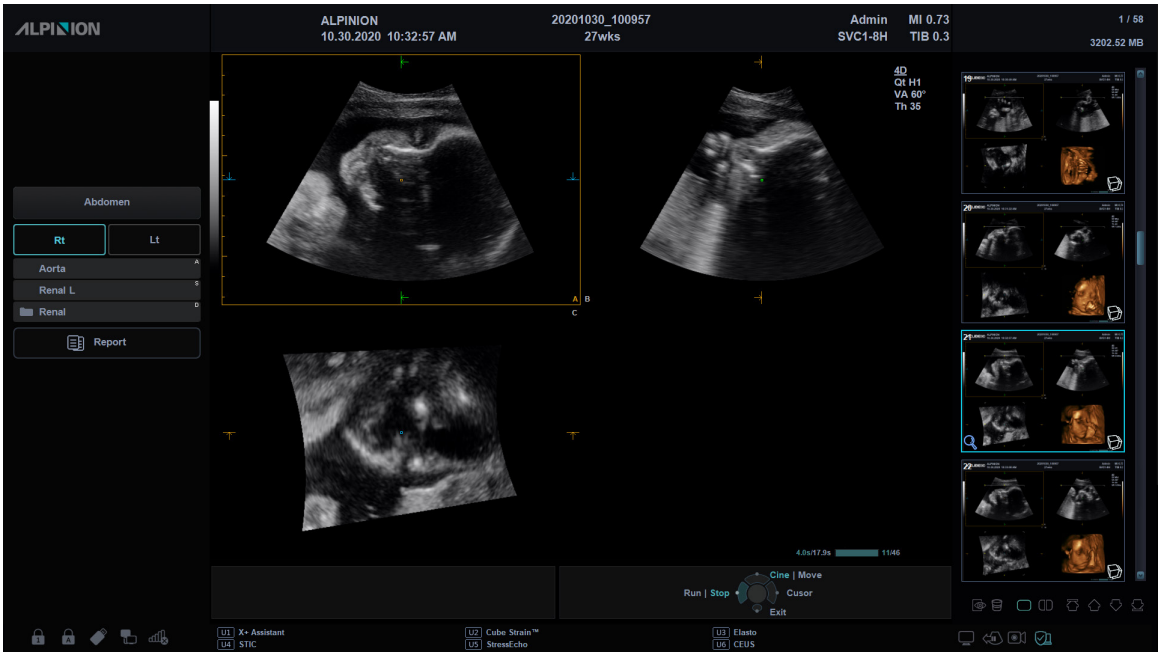


Figure 6-31 Multi Plane

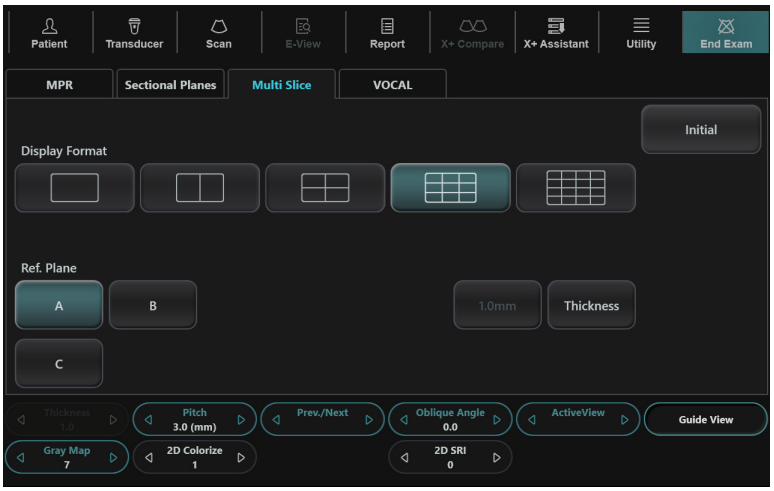


Figure 6-32 Multi Plane Parameters

Multi Plane parameters

The following table describes the Multi Plane parameters.

Table 6-9 Multi Plane parameters

Parameter	Description
Display Format	Select the display format.
Ref. Plane	Select a reference image from A, B, or C. The selected image will be highlighted with orange-colored frame.
Thickness	Select the slice thickness.
Cine	Manual selection of single volume frames.
Cine Calc.	Display the Cine Calculations menu.

Multi Plane workflow

To operate Multi Plane,

1. Select **Sectional Planes** on the touch screen.
2. Select **Multi Plane** on the touch screen.
3. Rotate the **Thickness** soft key to adjust the slice thickness.
4. Select a plane type via **Ref. Plane** to select a reference image.
5. Select **Cine Calc.** to activate the cine calculation.
   The slice playback menu appears on the touch screen.
6. Rotate the **Start** soft key to take the first slice.
7. Rotate the **End** soft key to take the last slice.
8. Rotate the **Speed** soft key to set the playback speed for cine images.
9. Select **Full** to start the playback of the full cine clip.
   Or select **Clip** to start the playback of the selected cine clip.
10. Select **Full** again to stop the playback of the full cine clip.
    Or select **Clip** again to stop the playback of the selected cine clip.

AnySlice

AnySlice allows you to observe the sectional images after drawing a curved line on the selected image in MPR mode.

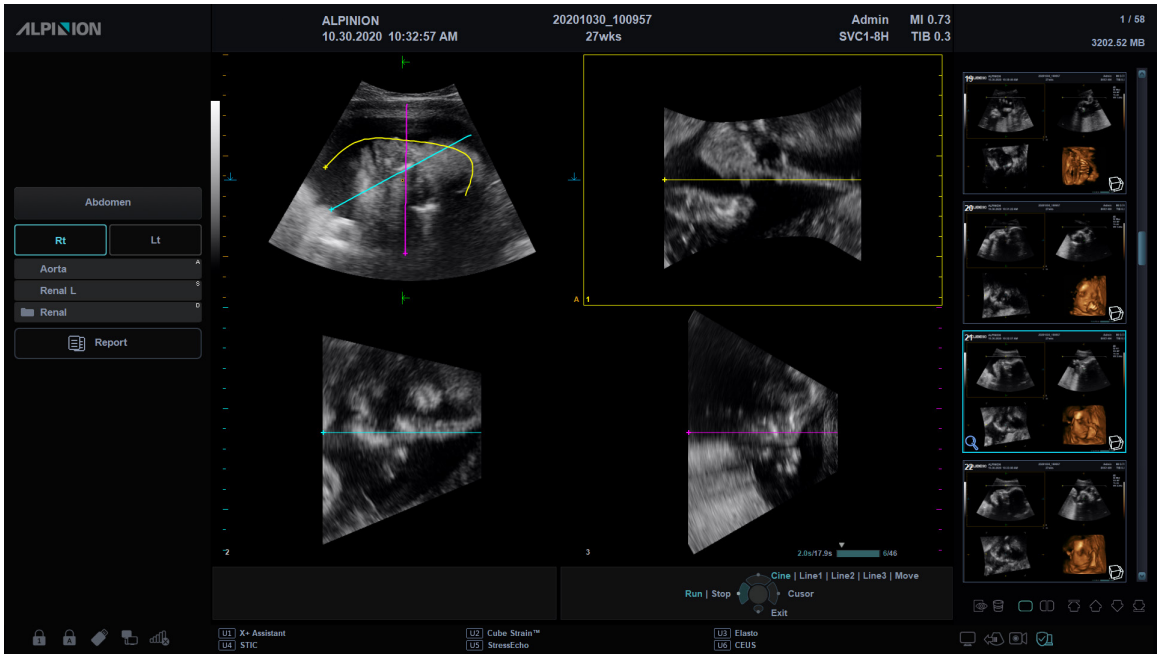


Figure 6-33 AnySlice

AnySlice parameters

The following table describes the AnySlice parameters.

Table 6-10 AnySlice parameters

Parameter	Description
Display Format	Select the display format.
Ref. Plane	Select a reference image from A, B, or C. The selected image will be highlighted with orange-colored frame.
Ref. Line	Select a reference line from 1, 2, or 3.
Thickness	Select the slice thickness.

AnySlice workflow

To operate AnySlice,

1. Select **Sectional Planes** on the touch screen.
2. Select **AnySlice** on the touch screen. The "✣" mark appears.
3. Select a reference line via **Ref. Line** on the touch screen.
   Or, press the **[Priority]** key to set the trackball to **Curved ROI**.
4. Use **[Trackball]** to draw a curved line on a reference image.
5. If you have finished drawing a line, press the **[Set]** key.
6. Optimize the image for observation by using parameters on the touch screen.

AnySlice screen

The reference image is displayed on the screen. The reference image is always placed on the upper left corner of the screen.

When more than one line is used to observation, each line is indicated by different color and number.

Cubic View

In Cubic View, the display shows Sagittal, Transverse, and Coronal plane images in volume data.

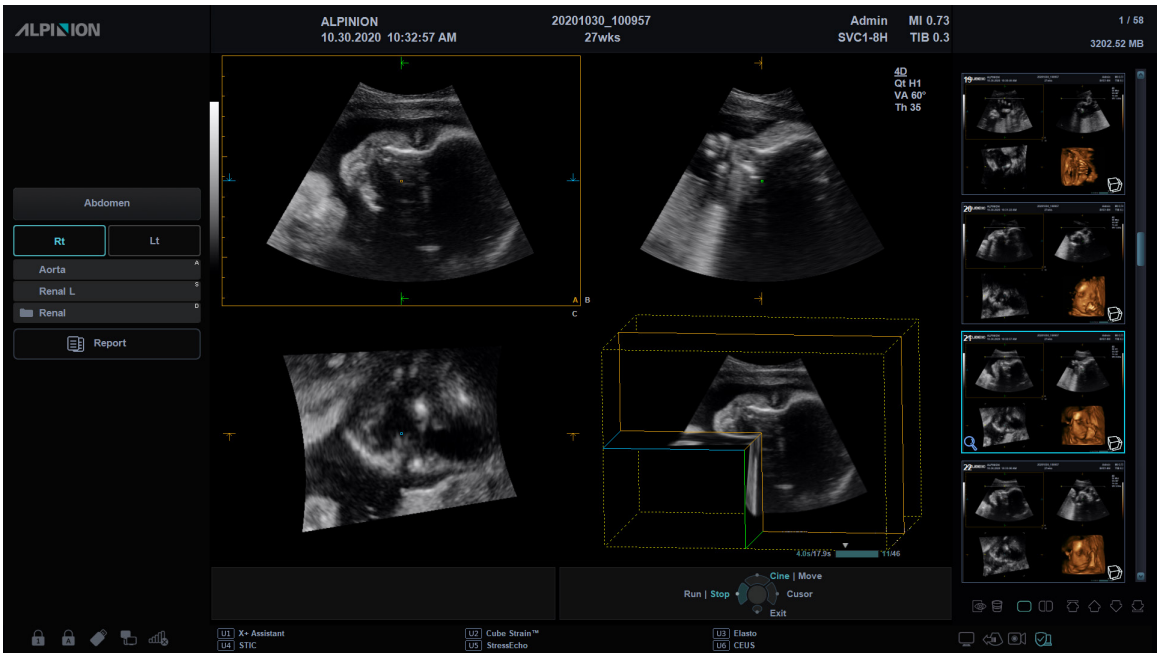


Figure 6-34 Cubic View

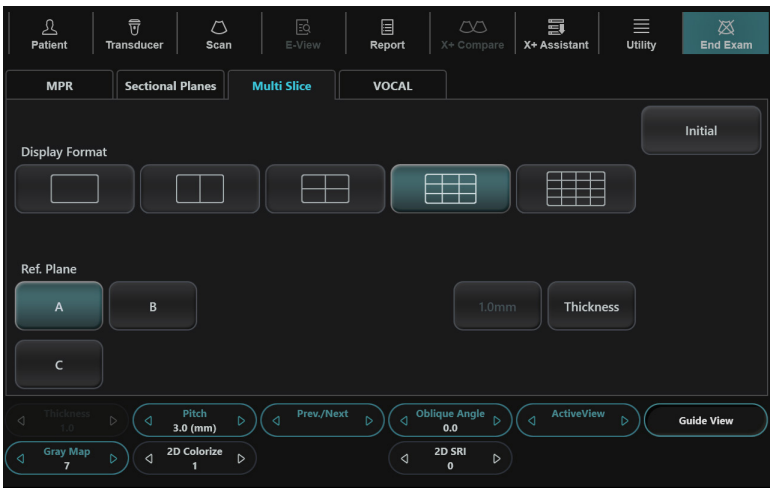


Figure 6-35 Cubic View Parameters

Cubic View parameters

The following table describes the Cubic View parameters.

Table 6-11 Cubic View parameters

Parameter	Description
Display Format	Select the display format.
Ref. Plane	Select a reference image from A, B, or C. The selected image will be highlighted with orange-colored frame.
Mode1, 2	Select the desired cube.
SlicePlaneA, B, C	Adjust the cube size.
Niche Rot. X, Y, Z	Rotate the cube along the X, Y, or Z axis.
Ref. Slice	Move the reference slice to the left and the right in parallel.

Cubic View workflow

To operate Cubic View,

1. Select **Sectional Planes** on the touch screen.
2. Select **Cubic View** on the touch screen.
3. Adjust the cube size by using the following methods:
   a. Using Trackball,
      (1) Select a reference image via **Ref. Plane** on the touch screen.
      (2) Select the Move item by pressing the **[Priority]** key on the control panel.
      (3) Select the Axis item by pressing the **[Set]** key on the control panel.
      (4) Adjust the volume size using **[Trackball]** key.
   b. Using the soft key,
      – Rotate the **SlicePlaneA**, **SlicePlaneB**, or **SlicePlaneC** soft key.
4. Rotate the cube along the X, Y, or Z axis by using **Niche Rot. X, Niche Rot. Y, or Niche Rot. Z soft key.**

NOTE

- In Cubic View, the dual image layout may not be available.
- You can rotate X, Y, and Z axes with the corresponding keys on the control panel.
- The volume review function is the same as the function in MPR.

Multi Slice

Multi Slice shows parallel cut slices (planes) which are aligned along the X, Y, or Z axis of volume's bounding box. The each texture is shown as an individual view. The reference image is distinguished with a dotted axis line.

NOTE

- The image layout keys (Single, Dual, and Quad) may not work for this view type.
- Multi Slice can be used when the display format is 3 x 3 or 4 x 4.

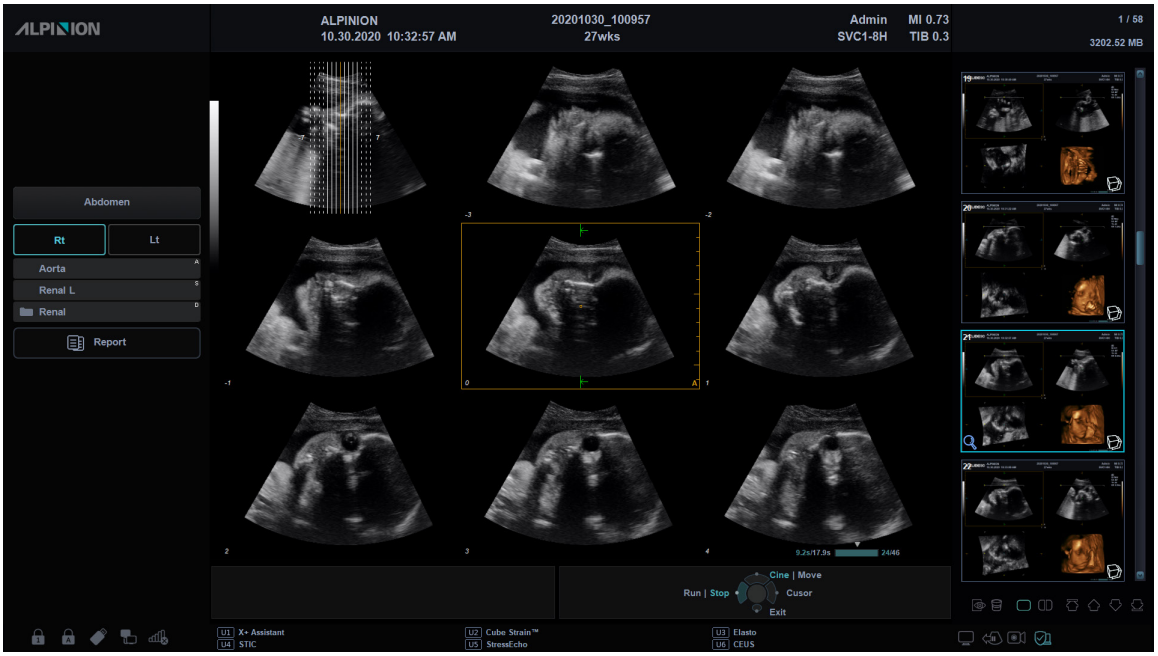


Figure 6-36 Multi Slice

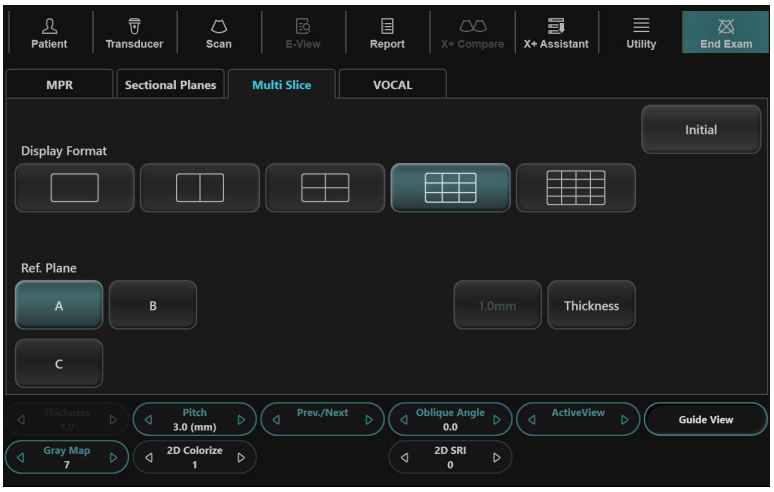


Figure 6-37 Multi Slice Parameters

Multi Slice parameters

The following table describes the Multi Slice parameters.

Table 6-12 Multi Slice parameters

Parameter	Description
Display Format	Set the layout of slice images. The number of slices that can be displayed simultaneously on the screen varies based on this setting.
Ref. Plane	Select a reference image from A, B, or C.
Thickness	Select the slice thickness.
Gray Map	Displays the gray map selections on the screen.
Pitch	Set the distance between multiple slices.
2D Colorize	Colorize the 2D image.
Prev./Next	Change the page on the screen. It is useful when the total number of slice images exceeds the number allowed by the current display layout. – Rotate the **Prev./Next** soft key clockwise for next images. – Rotate the **Prev./Next** soft key counter-clockwise for previous images.
Oblique Angle	Adjust the angle of the dotted axis lines on the refetence image.
2D SRI	Activate or deactivate SRI on the Multi Slice view.
ActiveView	Select a slice image to observe. The selected slice will be highlighted with orange-colored frame.
Guide View	Display the current plane in single image.
Initial	Select to delete the oblique image and reset the position information for Ref. Image.

General workflow

To operate Multi Slice,

1. Acquire the volume data.
2. Touch the **Multi Slice** tab on the touch screen.
   The Multi Slice soft menus appear on the touch screen.
3. Observe the interested structure through multiple slices.
   The reference image always displays and indicates which slices you are currently viewing as solid lines.
   - A solid line indicates the slice appears on the monitor.
   - A dotted line indicates the slice did not appear on the monitor.
4. Set the distance between slices by rotating the **Pitch** soft key.
5. If necessary, select the reference image via **Ref. Plane**.
6. Select the proper image layout via **DIsplay Format** according to the size of the target structure.

VOCAL (Virtual Organ Computer-aided Analysis)

VOCAL (Virtual Organ Computer-aided Analysis) allows you to measure the volume of tissues in 3D/4D modes.

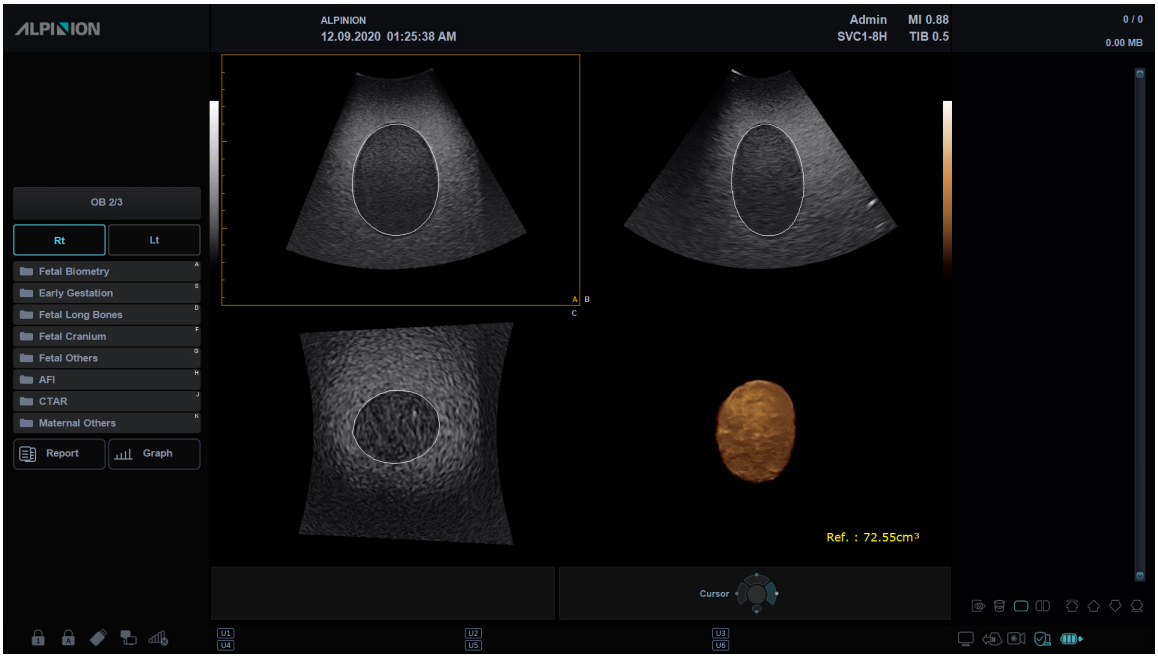


Figure 6-38 VOCAL Display

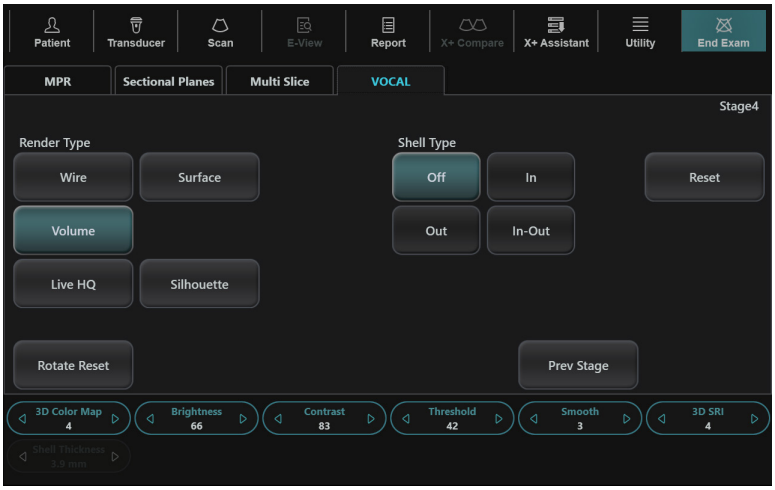


Figure 6-39 VOCAL Touch Screen

VOCAL_Stage 1, 2

In VOCAL Define mode, you can specify how slice and contour lines are retrieved.

Table 6-13 VOCAL parameters_Stage1

Parameter	Description
Segment Mode	Specify the method to outline the object. • **Sphere**: Draw a sphere-shaped outline. After creating a spherical object, edit its contour to make it into the desired shape. • **Manual**: Draw an outline of the object manually. The number of manually generated contours depends on the selected segment angle. • **Auto**: An outline of the object is created automatically.
Structure	Structure is only available with the **Auto** method. You can select **Hypo** or **Hyper**. • **Hypo**: Typically for hypo-echoic lesions, breast tumors, irregular shaped internal structures not surrounded by fluid. • **Hyper**: Typically for solid lesions and structures such as uterus, endometrium, kidney, prostate, thyroid, fibroadenoma, lymph nodes, etc.
Segment Angle	Specify the angular spacing between contour traces. (10°, 15°, 30°) It defines how many contours have to be generated.
Next Stage	Select to move to the next stage when you're ready to perform the trace.

Table 6-14 VOCAL parameters_Stage2

Parameter	Description
Frame	Select the frame to draw an outline of the object.
Reset	Remove the trace from the image. The VOCAL data are deleted, and the system returns to Stage 1.
Prev Stage	Select to move to the previous stage.
Next Stage	Select to move to the next stage.

1. Acquire the volume data.
2. Touch the **VOCAL** tab on the touch screen.
   The VOCAL soft menus appear on the touch screen.
3. Select the volume calculation method via **Segment Mode.**
4. Specify the angular spacing between contour traces via **Segment Angle.**
5. If necessary, specify the structure via **Structure.**
6. Select **Next stage** on the touch screen.
7. If the Segment Mode is set to **Manual**,
   a. Use **[Trackball]** to trace the anatomy and press the **[Set]** key
   b. The trace is performed on each image slice, separated by the segmental angle.

c. Rotate the **Frame** soft key until you have completed the total of the required rotations.

d. After you've completed the trace target, select the **Next Stage** on the touch screen.

8 The VOCAL image appears in the lower, right-hand corner of the display.

VOCAL_Stage 3

In VOCAL Edit Mode, you can modify or redraw the existing contour lines. And you can set the Shell Type and Shell Thickness.

Table 6-15 VOCAL parameters_Stage3

Parameter	Description
Render Type	Set the shell of an object based on its contour line. • **Surface**: VOCAL data are represented using the method of expressing the exterior of images by curves. • **Wire**: Represent VOCAL data with dots and lines.
Shell Type	Set the shell type. • **Off**: Select if you do not want a shell around the VOCAL image. • **In** : Select Inside if you want a shell inside the volume. • **Out**: Select Outside if you want a shell outside the volume. • **In-Out**: Select Symmetric if you want half of the shell thickness inside and half outside the volume's perimeter.
Rotate X, Y, Z	Rotate the VOCAL image along the X, Y, or Z axis.
Rotate Reset	Reset the rotation of the VOCAL image.
Edit Frame	Select the frame to edit the trace.
Shell Thickness	Adjust the thickness of the shell.

1 If necessary, edit the VOCAL image.
You can apply the shell type, adjust its thinkness, rotate the VOCAL image, or restart the VOCAL.

– Apply a shell type via **Shell Type**.

– Adjust the thickness of the shell by rotating the **Shell Thickness** soft key.

– Adjust the plane A with X, Y, Z rotation to achieve the correct measuring plane.

2 After you've completed editing VOCAL image, select the **Next Stage** on the touch screen.

3 The calculated VOCAL image and the measurement result are displayed on the screen.

VOCAL_Stage 4

You can optimize the VOCAL data for review. The calculated VOCAL image and the measurement result are displayed on the screen.

Table 6-16 VOCAL parameters_Stage4

Parameter	Description
Render Type	Set the shell of an object based on its contour line. • **Surface**: VOCAL data are represented using the method of expressing the exterior of images by curves. • **Wire**: Represent VOCAL data with dots and lines. • **Volume**: Represent VOCAL data with Silhouette imaging or Live HQ imaging.
Rotate Reset	Reset the rotation of the image.
Prev Stage	Select to move to the previous stage
3D Color Map	Select the desired color map.

STIC (Spatial Temporal Image Correlation)

With STIC (Spatial Temporal Image Correlation), the fetal heart or vascularity can be visualized in 3D/4D modes. This acquisition method is designed for beating (fetal heart) as well as blood perfused organs.

NOTE

STIC is an optional feature. For using these feature, you need an additional request to your local agent.

STIC setup mode

All touch screen/control panel keys and trackball controls are same as in 3D/4D mode. Therefore only the STIC relevant controls are described here:

Table 6-17 STIC Imaging options

Parameter	Description
Acq. Time	Adjust the acquisition period (7–20 sec). Only available in STIC.
Volume Angle	Adjust the volume angle. Only available in STIC. • Volume Convex: 15 - 80 • Volume Endocavity: 10 - 95

STIC acquisition mode

In STIC mode, you can acquire 3D images through an acquisition interface.

1. Obtain a 2D image and optimize the image for the best quality.
2. If necessary, obtain a CF image and optimize the image for the best quality.
3. On the control panel, press the **[3D/4D]** key. The yellow-colored ROI and soft menus for 3D or 4D mode appear.
4. Touch the **STIC** tab on the touch screen.
5. Rotate the **Render Direction** soft key to change the direction of the image view.
6. Rotate the **Acq. Time** soft key to set the aquisition period.
7. Rotate the **Volume Angle** soft key to change the sweep angle.
8. Perform the scan.

   NOTE

   Make sure you perform the scanning coutinuously until the fetal heart rate is calculated.
9. When you have finished, press the **[Freeze]** key on the control panel to acquire the image data.
10. The fetal heart rate is calculated, and the dialog box appears.
11. If you accept the calculated fetal heart rate, click **Yes** and go to MPR view.
12. If you do not accepted the calculated fetal heart rate, click **No** and perform the image acquisition again.

STIC visualization mode

In STIC mode, all settings and view types of 3D/4D modes are available.

Saving a 3D/4D Image

You can save 3D or 4D volume data in the system memory.

To save an image or volume data,

1. Acquire a 3D or 4D volume image.
2. Press the **[P1]** key (or the assigned print key) on the control panel to save the still image.
   Press the **[P2]** key (or the assigned print key) on the control panel to save the volume data.

NOTE

- To assign the print keys for saving an image or volume data, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
- Saving a real-time image may not be available in 4D mode.

To review an image or volume data,

– On the touch screen, select **Review**, and then select an image. You can also click a saved thumbnail image on the right side in 2D mode.

NOTE

After saving a video or volume data, you can configure the render settings.

Exiting 3D/4D Mode

To exit 3D or 4D mode,

– Press the **[2D]** key on the control panel.

7

Scanning and Display Functions

This chapter consists of information about the scanning/display functions.

Freezing Images

Condition in which 2D, M, Doppler, and Color flow image data are retained in a scan converter's memory for examination and/or photograph as well as for video recording.

Freezing an image

1 While scanning an image, press the **[Freeze]** key on the control panel to freeze the image.
You can also freeze an image with the right pedal of the footswitch, if supported.

2 To reactivate the image, press the **[Freeze]** again.
To enter Cine mode, use **[Trackball]**.

NOTE

- Deactivating the **[Freeze]** key allows you to erase all measurements including calculations from the screen (Not from the worksheet).
- Selecting a new transducer unfreezes the image.
- To configure the each pedal of the footswitch, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
- To configure the **[Freeze]** key function after freezing an image, go to **Utility** > **Setup** > **SystemPreset** > **System** > **Control Panel** > **Key** > **Active Function on Freeze**.

Processing an image

In freeze mode, you can process 2D, Color Flow (CF) or Doppler mode image. The following controls are available:

2D mode	CF mode	PD mode	PWD mode
Zoom	Threshold	Threshold	Baseline
Reverse	Baseline	Baseline	Gain
Gain	Invert	Invert	Sweep speed
Dynamic range	Color map	Color map	Invert
Up/Down	Gain	Gain	Colorize
Colorize	Blend	Blend	Gray map
Gray map	Adaptive Blend	Adaptive Blend	Auto Angle
Full SRI	Colorize	Colorize	Angle Correction
Edge Enhance			Reject
Reject			Dynamic Range
			Auto Calc.

Zooming Images

You can magnify a region of interest (ROI) in a live image or in Cine mode. The zoom option magnifies the ROI on the display. There are two zoom functions that you can use: Read zoom and Write zoom

Read zoom

Read zoom allows you to manipulate the negative picture and enlarge it. You can use Read zoom after using Write zoom.

To activate Read zoom, rotate the **[Zoom]** key on the control panel.

Write zoom

Writing zoom allows you to use the telephoto lens to bring the image closer before acquiring an image. You can use Write zoom after using Read zoom.

To activate Write zoom, press the **[Zoom]** key on the control panel while scanning a live image.

Full Screen

Full Screen allows you to view magnified images in full screen.

Full Screen Display

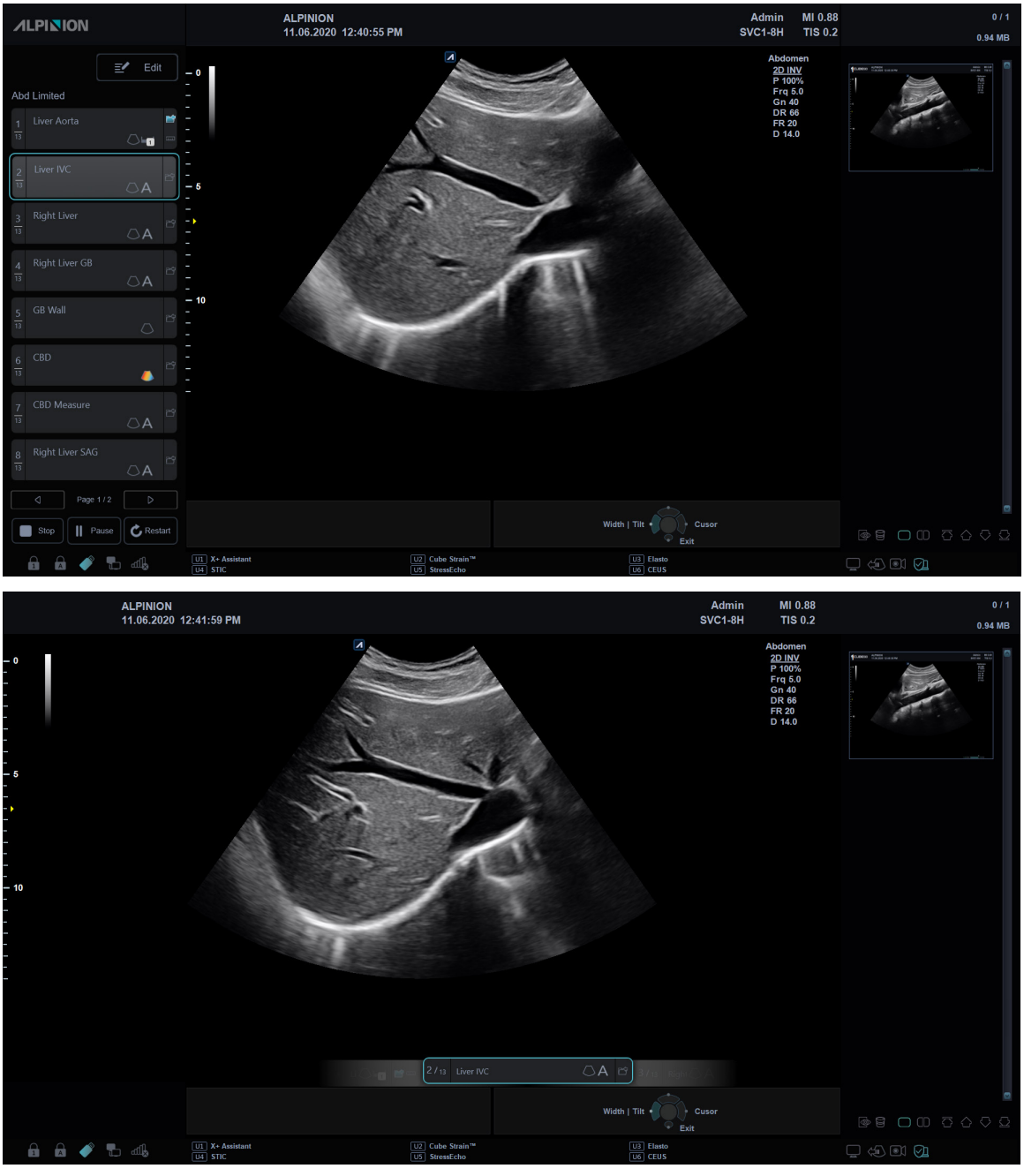


Figure 7-1 Full Screen Display

To activate and exit the Full Screen mode,

1. On the touch screen, select **Full Screen** in the **2D** tab.
   The magnified image is displayed in full screen.
2. To exit the Full Screen mode, select **Full Screen** again.

Screen Split

Screen Split allows you to view active images as the dual display view.

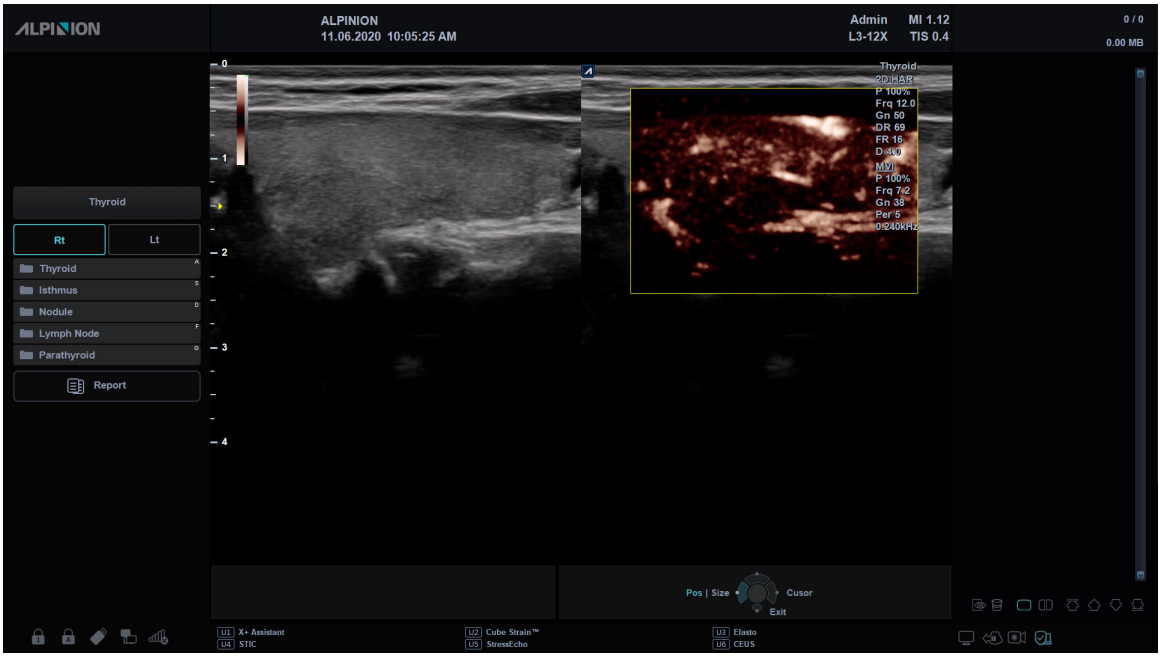


Figure 7-2 Dual Mode Display

To operate the Screen Split function,

1. Press the **[Dual]** key on the control panel.
2. To display other active images, press the **[Dual]** key again.

Cine Images

The Cine function is available in all imaging modes. During the real-time imaging, the system places the most recently acquired images as well as the image currently on the screen into a cine memory buffer.

Cine image review functions as a storage and enables you to review the sequence of images in the system memory. Cine review is available by pressing the **[Freeze]** key. Moving **[Trackball]** to the left or right scrolls through the cine sequence.

Images from a cine sequences can be measured and annotated. You can play back cine images to simulate a real-time motion, or review an image at one time.

NOTE

Cine is useful for focusing on images during a specific part of the heart cycle or to view short segments of a scan session.

Using Cine

You can acquire and save a loop from the current exam. The cine loops are identified by the video icon ( ) located in the bottom right corner of the thumbnail.

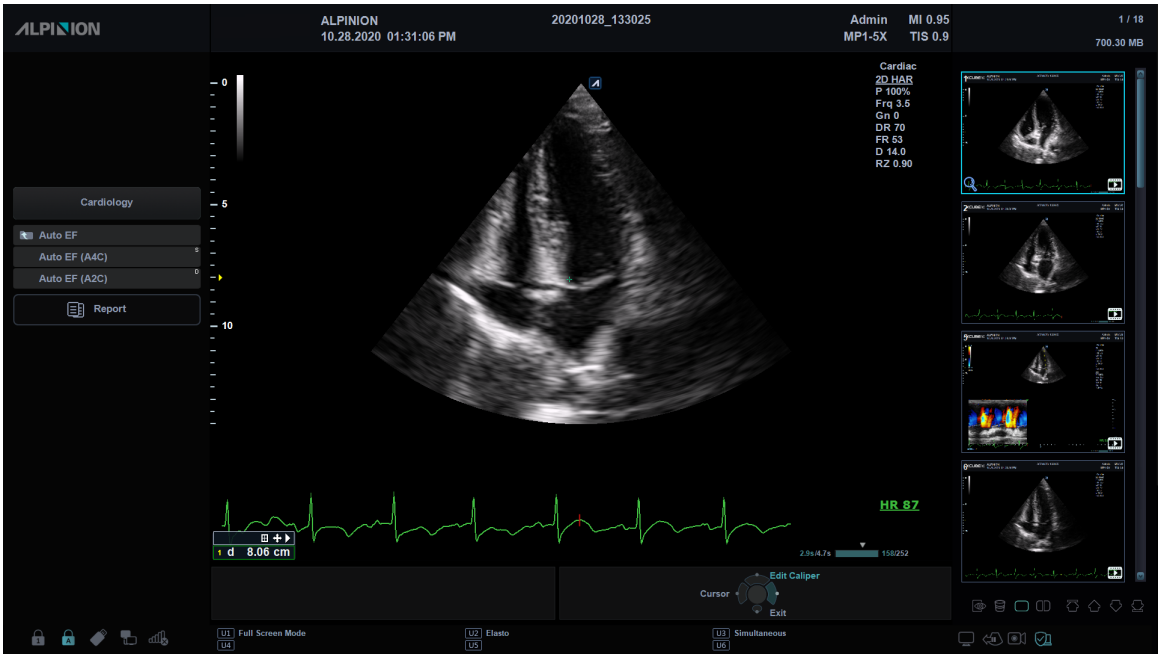


Figure 7-3 Cine Mode Display

Cine Gauge Bar

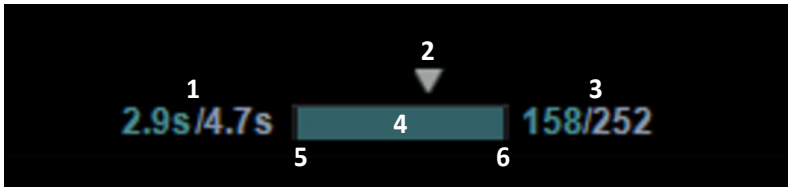


Figure 7-4 Cine Gauge Bar

1	Current number of seconds/total number of seconds	**4**	Cine gauge
2	Current frame	**5**	Start frame
3	Current frame number/total frame number	**6**	End frame

Cine Touch Screen

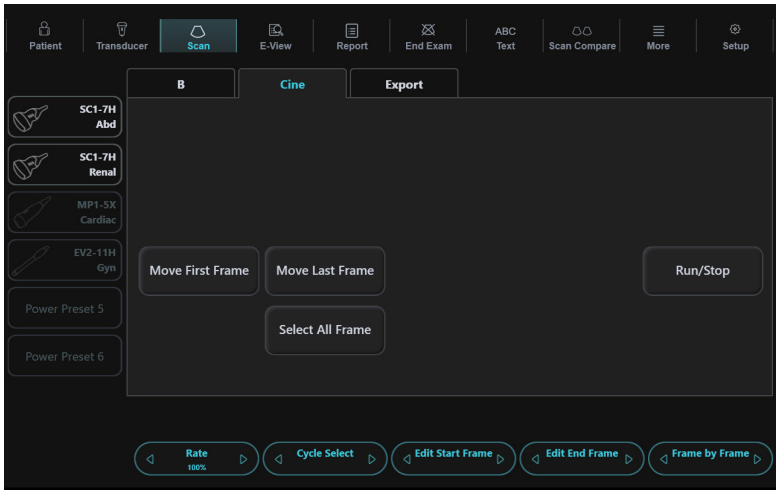


Figure 7-5 Cine Touch Screen

Table 7-1 Cine touch screen description

Parameter	Description
Run/Stop	Start/Stop the cine loop review.
Move First Frame	Move to the first frame of cine loop.
Move Last Frame	Move to the last frame of cine loop.
Select All Frame	Select all frames of the cine loop.
Rate	Adjust the cineloop playback speed.
Cycle Select	Select the heart cycle to review.
Edit Start Frame	Define new beginning point of a cine loop.
Edit End Frame	Define new ending point of a cine loop.

Parameter	Description
Frame by Frame	Review the cine image frame by frame manually.

Activating Cine

To activate cine,

1. Press the **[Freeze]** key on the control panel. The cine controls appear.
2. Use the cine controls to play the cine loop.

Previewing a Cine Loop

1. Press the **[Freeze]** key on the control panel.
   Or select the cine loop thumbnail on the clipboard.

   NOTE
   The cine loops are identified by the video icon ( ) located in the bottom right corner of the thumbnail.
2. Touch the **Cine** tab on the touch screen.
3. Use **[Trackball]** to scroll through the cine sequences.
4. To view the cine loop frame by frame, rotate the **Frame by Frame** soft key.
5. Select **Move First Frame** on the touch screen to take the first frame.
6. Select **Move Last Frame** to take the last frame.
7. If necessary, edit the cine loop.
   - Rotate the **Edit Start Frame** soft key to define new beginning point of a cine loop.
   - Rotate the **Edit Edit Frame** soft key to define new ending point of a cine loop.
8. Rotate the **Cycle Select** soft key to select the heart cycle to review.
9. Select **Run/Stop** on the touch screen to run the cine loop.
10. Press the print key on the touch screen to store the cine loop.
11. Select **Run/Stop** again to stop the cine loop.
12. Press the **[Freeze]** or **[2D]** key to return to scanning.

Adjust the Cine Loop Speed

Rotate the **Rate** soft key to set the speed of the cine loop playback.

Recalling a Cine Loop

To recall a cine loop from the clipboard,

1. Press the **[Cursor]** key to obtain the cursor.
2. Using **[Trackball]** to move the cursor over the thumbnail image you want to reload.
3. Double-click the thumbnail image you want to reload.

NOTE

The cine loops stored on the clipboard are identified with the video icon ( ).

Annotating Images

The annotation feature provides the capability to type the comments of free text or insert the pre-defined comments from the comment library. It also provides the user with arrow marks to point to parts of the image.

You can place text labels and arrow marks on an image to identify anatomical structures and positions and also annotate an image with a body marker image that indicates the part of the anatomy that you are scanning.

NOTE

The annotation feature is available in live-acquisition mode and in freeze mode.

Annotation Display

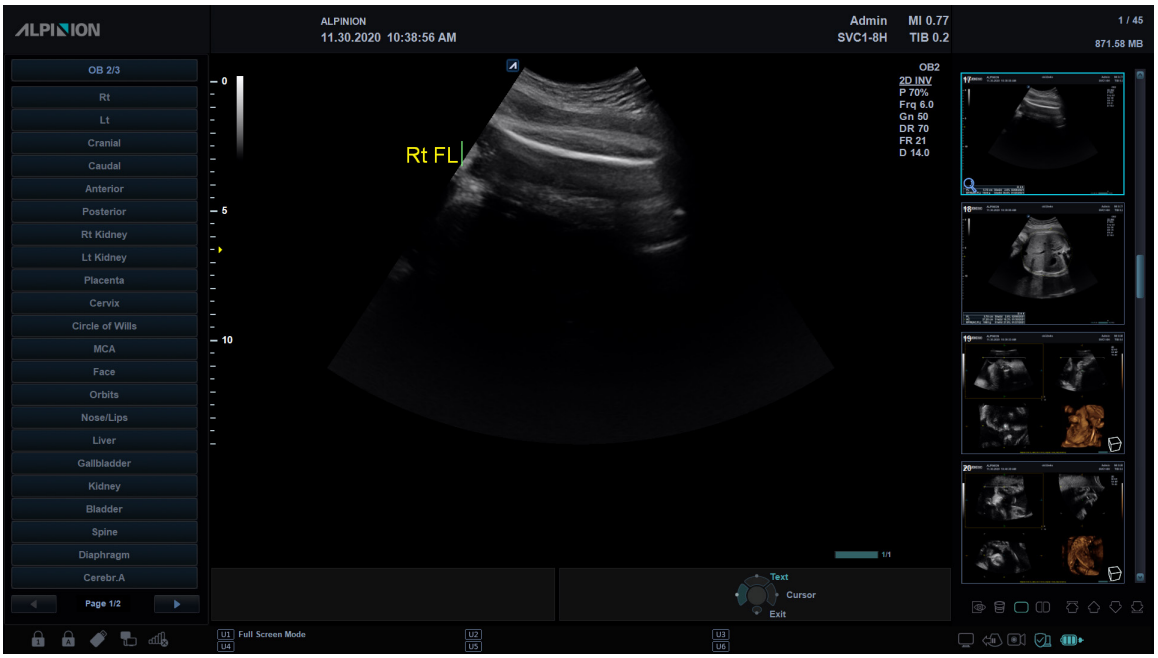


Figure 7-6 Annotation Display

Annotation Controls

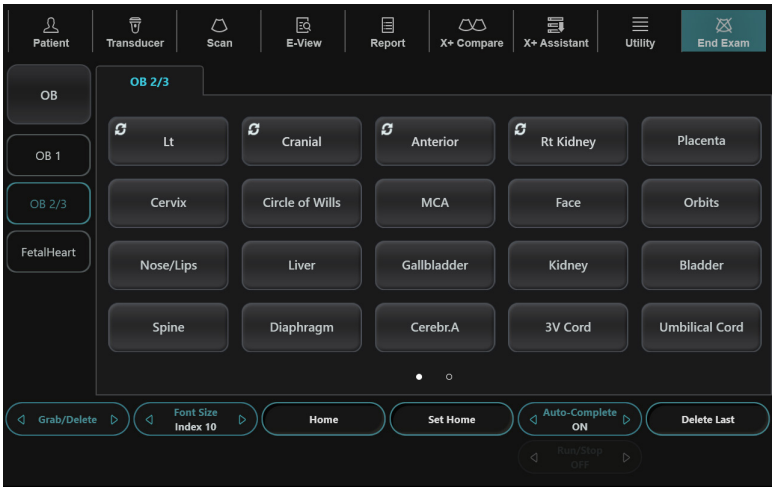


Figure 7-7 Annotation Touch Screen

General Workflow

To activate and exit Annotation mode,

1. Press the **[Text]** key on the control panel.
2. To configure the default position of the comment cursor, use **[Trackball]** to place the comment cursor to the desired location of the image screen and select **Set Home** on the touch screen.
3. The system automatically searches for the word you want in the text bar.
4. After activating the text mode, a vertical bar type cursor appears on the screen. Use **[Trackball]** to move the cursor.

   NOTE

   The default text color is yellow. The color selection can be changed to any of the colors available on the system.

5. When a specific comment or comment group is selected, the color turns to green. Once the comment is set or fixed, the color returns to yellow or to the user-selected color.
6. Delete characters or all comments, if necessary.
   - To delete comments by character, select **Back Space** on the touch screen.
   - To delete comments by word, rotate and press the **Grab/Delete** soft key.
   - To delete the comments only, press the **[Clear]** key right after pressing the **[Text]** key.
   - To delete the arrow marks only, press the **[Clear]** key right after pressing the **[Arrow]** key.
   - To delete all comments as well as arrow marks, press the **[Clear]** key after entering the scan mode.
7. Rotate the **Grab/Delete** soft key to move a group of words on the screen.
8. To exit Annotation mode, press the **[Text]** key again.

Inserting Annotations

Inserting directional arrow pointers

1. Press the **[Arrow]** key on the control panel.
   An arrow pointer appears on the image screen. The green-colored pointer indicates that it is active and movable.
2. Use **[Trackball]** to move the pointer to the desired position of the screen. The pointer head direction can be controlled as you move **[Trackball]**.
3. Adjust the length, thickness, or the angle of the pointer, if necessary.
   - To select the type of the pointer you want, rotate the **Arrow Type** soft key.
   - To change the size of the pointer you want, rotate the **Arrow Size** soft key.
   - To adjust the direction of the pointer head, rotate the **Arrow Angle** soft key.
4. Press the **[Set]** key to fix the placement of the pointer and the direction of the pointer head.
   The GREEN color turns to YELLOW (or the default color if changed).

Annotating images using the library

To reduce the amount of time spent annotating an image, store frequently-used comments in the comment library.

1. Press the **[Text]** key on the control panel.
2. Rotate the **Application** soft key to select the desired application.
3. Rotate the **Library** soft key to select the desired comment library.
4. Select the desired comment on the touch screen.
5. Use **[Trackball]** to move the selected comment to the desired position of the screen.
6. When you have finished, press the **[Set]** key.

Annotating images with typed words

1. Press the **[Text]** key on the control panel.
2. Type the desired comment using the QWERTY keyboard.
   Press the **[Enter]** key to change or add line.

   NOTE
   To complete a comment automatically, rotate the **Auto-Complete (on)** soft key.
3. To change the font size of comments, rotate the **Font Size** soft key.
4. Use **[Trackball]** to move the comment to the desired position of the screen.
5. When you have finished, press the **[Set]** key.

Editing Annotations

Moving text

You can move the entered text to the desired place.

1. To select the desired comment or comment group, rotate the **Grab/Delete** soft key.
   The selected comment color turns to green.
2. Use **[Trackball]** to move the selected comment to the desired position of the screen.
3. When you have finished, press the **[Set]** key to fix the position.

Replacing text

1. To select the desired comment, rotate the **Grab/Delete** soft key.
   The selected comment color turns to green.
2. Type a new comment to replace the selected comment. Or select the desired comment on the touch screen.
3. When you have finished, press the **[Set]** key.

Adding text

1. Place the comment cursor onto the desired text position to correct the comment and press **[Set]** key.
2. Select **Back Space** on the touch screen to delete comment by character, if necessary.
3. Type a new text to add to previous comments.
4. When you have finished, press the **[Set]** key.

Deleting Annotations

To delete all fixed text and pointers,

- Press the **[Clear]** key on the control panel.
- Press the **[Clear All]** key on the QWERTY keyboard.

Body Pattern

Body Pattern is an additional way to annotate the image. Body patterns are small graphic images represent the anatomy being examined. Using body patterns and transducer marker, you can indicate the scan position and the position of the transducer during the examination.

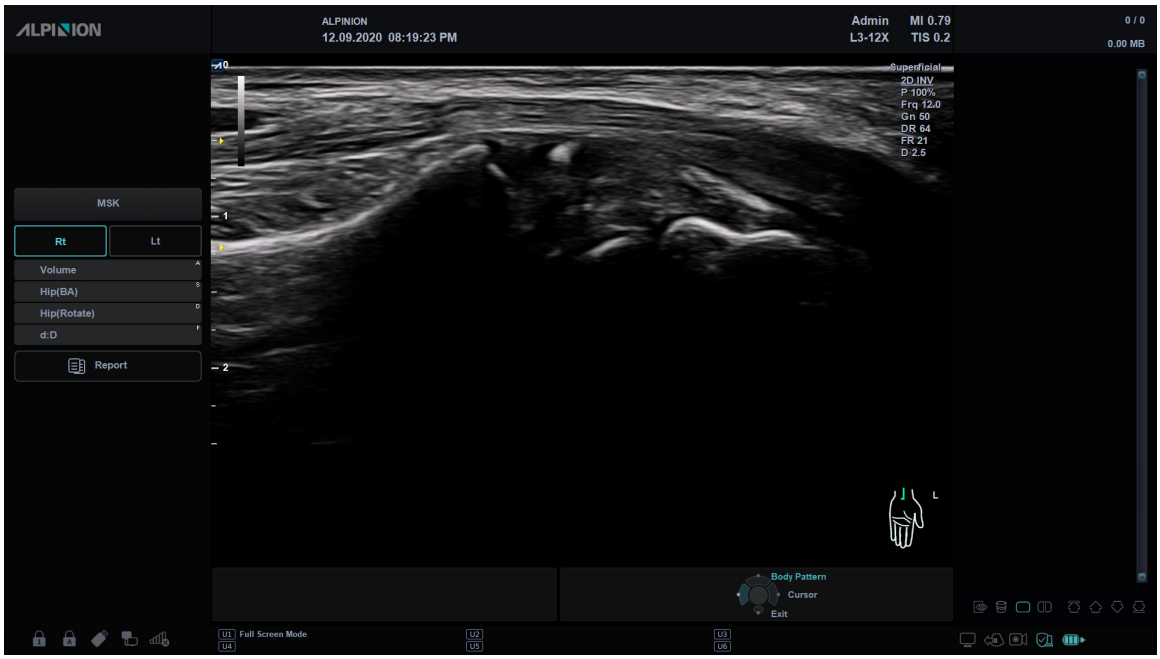


Figure 7-8 Body Pattern Display

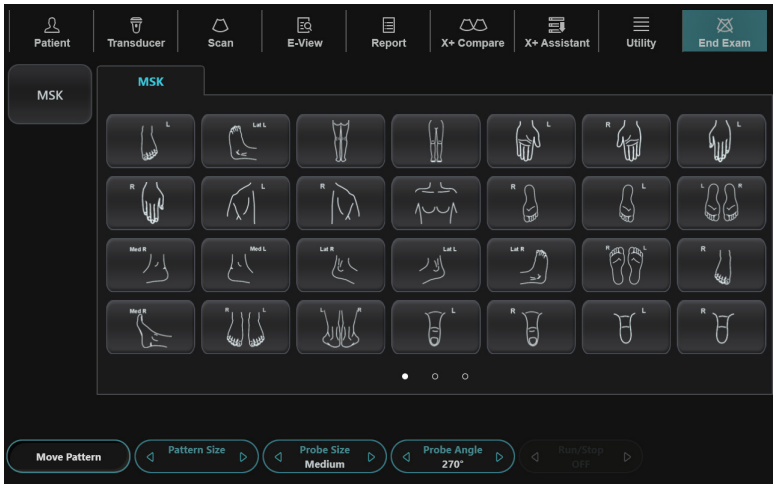


Figure 7-9 Body Pattern Touch Screen

Inserting a body pattern

1. To activate Body Pattern, press the **[Body Pattern]** key on the control panel.
   A list of body patterns appears on the touch screen.
   A default body pattern is displayed automatically when Body Pattern is activated.

   NOTE

   The body pattern list can be configured in **Utility** > **Setup** > **SystemPreset** > **Annotation** > **BodyPattern**.

2. Rotate the **Library** soft key to select the desired application.

   NOTE

   The body pattern list that appears on the touch screen will vary depending on the selected application.

3. Select the desired body pattern on the touch screen.
   The body pattern with a transducer marker is shown on the screen.
4. To reposition the body pattern, press the **Move Pattern** soft key.
5. Use **[Trackball]** to adjust the position of the body pattern and press the **[Set]** key.
6. Rotate the **Probe Size** soft key to select the desired size of transducer marker.
   The selected transducer marker appears on the screen.
7. Rotate the **Probe Angle** soft key to adjust the angle of the transducer marker.
8. Use **[Trackball]** to adjust the position of the transducer marker and press the **[Set]** key.

Deleting a body pattern

To delete a body pattern,

- Press the **[Clear]** key on the control panel.
- Press the **[Clear All]** key on the QWERTY keyboard.

8

General Measurements and Calculations

This chapter describes how to perform general measurements, calculations and report functions.

Overview

Measurements and calculations based on ultrasound images are intended to complement other clinical procedures available to the physician. The accuracy of the measurement is determined not only by the system precision, but also by the use of the proper medical protocol by the user.

WARNING

The system provides calculations (eg, estimated fetal weight) and charts based on published scientific literature. It is the responsibility of the user to select the appropriate chart and clinical interpretation of the calculations and charts. The user should consider the contraindications for the use of calculations and charts described in the scientific literature. The diagnosis, decision of further examination and medical treatment should be performed by a qualified person following good clinical practice.

Measurement Display

Figure 8-1 Measurement Menu Display

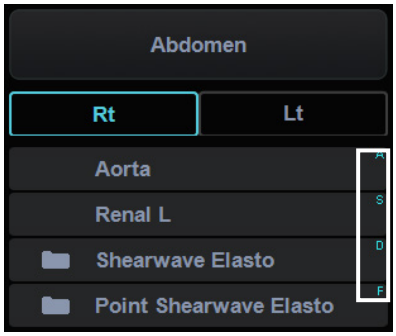
1	Measure reference window	**5**	Graph
2	Labeled measurement	**6**	Result window
3	Direct keys	**7**	Mini Report
4	Report		

Direct key

With the Direct key feature, you can quickly access measurement menus by simply pressing alphanumeric keys on the QWERTY keyboard. There are total of 16 available keys: A, S, D, F, G, H, J, K, L, Z, Y, C, V, B, N, M

1 Press the **[Caliper]** key on the control panel.

2 From the labeled measurement menu, press an alphanumeric key to access the menu you want. You can see the corresponding direct key on the right side of the menu.



3 Repeat step 2 until the desired menu appears.

Measurement result window

After performing the measurement, the system automatically makes the calculation related to the performed measurement, and the measured values and calculated values are displayed in the measurement result window.

The measurement result window can be moved so that the result window does not obscure the ultrasound image.

You can change the window status by selecting one of the following icons:

Table 8-1 Measurement result window

Icon	Description
	Change the background type (e.g. transparent or opaque) of the ***Result*** window.
	Change the position of the ***Result*** window.
	Display the Mini Report.

Measurement Controls

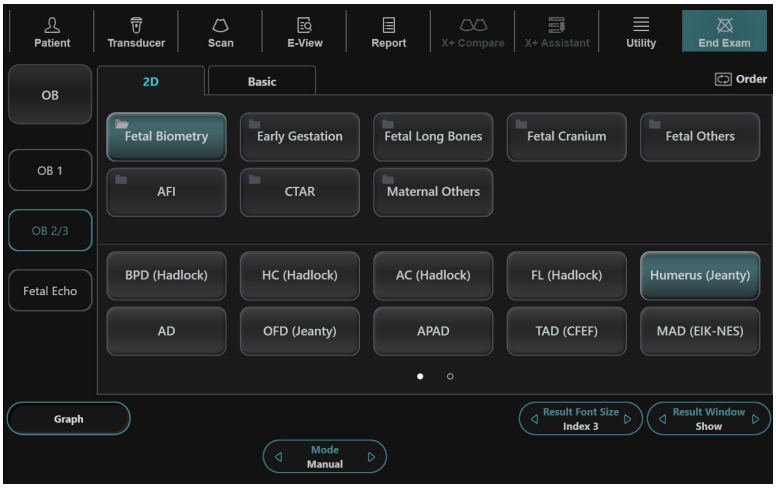


Figure 8-2 Measurement and Display Controls

The following table describes the measurement and display controls.

No	Control	Description
1	**Result Window**	Show or hide the measurement result window.
2	**Result Font Size**	Select a font size for the measurement results.
3	**Graph**	Access OB Graph page (applies only to OB).

General Workflow

To select or change a measurement type,

– Select the desired measurement type on the touch screen.

NOTE

The type of measurement depends on the current scan mode.

To adjust the font size for the measurement results,

– Rotate the **Result Font Size** soft key.

To show or hide the result window,

– Rotate the **Result Window** soft key.

To modify a measurement result,

1. Click the result value you want to change from the ***Result*** window.
   The caliper is activated.
2. Use **[Trackball]** to change the measurement value and press the **[Set]** key.
   – To switch the caliper mark of the current value, press the **[Caliper]** key when the caliper is active.
   – To activate the caliper of another value, press the **[Priority]** key repeatedly until the desired value is highlighted.

To delete a measurement result,

1. Click the result value you want to delete from the ***Result*** window.
   The caliper is activated.
2. Press the **[Clear]** key on the control panel.

To return to scanning,

– Press the **[2D]** key on the control panel.

Basic Measurements

Each application has a basic study. The basic studies provide you quick access to measurements such as volume, angle, A/B ratio, and % stenosis. The particular measurements available in each basic study vary, depending on the application and the mode. This section describes measurements, organized by mode.

To begin the basic studies,

1. Press the **[Caliper]** key on the control panel.
   The **Basic** tab appears on the touch screen.
2. Select the desired basic measurement on the touch screen.
   If you select the measurement folder, the sub menus are displayed. You can select the measurement on the touch screen.
3. Perform the measurement.

Basic Measurement Units

Table 8-2 Basic measurement unit

Mode	Measurement	Unit	Abbreviation
2D mode	Distance	centimeters	cm
	Area	centimeters^2	cm^2
	Circumference	centimeters	cm
	Angle	degree	deg
	%Stenosis	percent	%
	Volume	milliliter	ml
	Disk Volume	milliliter	ml
	Volume Flow Area	centimeters^2	cm^2
M mode	Distance	centimeters	cm
	Time	milliseconds	ms
	Slope	centimeters per second	cm/s
	%Stenosis	percent	%
	HR	beats per minute	bpm
D mode	Velocity	centimeters per second	cm/s
	PG	millimeters mercury	mmHg
	Time	millisecond	ms
	VTI	centimeters	cm
	Acceleration	centimeters per second^2	cm/s^2
	HR	beats per minute	bpm
	Volume Flow	Volume milliliter per minute	ml/min

Measurement Formula

Table 8-3 Measurement formula

Mode	Measurement	Method	Formula
2D	Circumference	Ellipse	$C = 2\pi \times \sqrt{\frac{D1^2 + D2^2}{2}}$
	Area	Ellipse	A= π(D1)(D2)/4
	%Stenosis	2 Diameter 2 Area	%Steno= (1- min(D1, D2)/max(D1, D2))X100 %Steno= (1- min(A1, A2)/max(A1, A2)X100
	Volume	1 Distance 2 Distance 3 Distance Ellipse Distance + Ellipse	$V= \pi D1^3/6$ V= D1X D2Xmin(D1, D2)Xπ/6 V= πD1XD2XD3/6 V= D1XD2Xmin(D1, D2)Xπ/6 V= πD1XD2XD3/6
	Disk Volume		$V = \sum_{m=1}^{20} \frac{\pi}{4} l_m^{\ 2} \times (\frac{D}{20})$
	Volume Flow Area		A= π/4XD2
M	Slope		S= (D1-D2)/ΔT
	HR		HR= Cycle number/ΔT*60
D	Acceleration		Accel= (V1-V2)/ΔT
	PI		PI= (PS-ED)/Vmean
	RI		RI= (PS-ED)/PS
	HR		HR= Cycle number/ΔT*60
	Volume Flow	Distance	Vol. Flow= AXTAmax (or TAmean)X60/ 1000 (A=π/4XD2)

Basic Measurements

The basic measurements are available in the following imaging modes:

- 2D mode
- M mode
- Doppler mode

2D mode measurements

The basic 2D mode measurements include the following measurement parameters:

- Tissue depth
- Distance
- Circumference and Area
- Angle
- Volume
- Stenosis
- A/B Ratio
- Disk Volume
- Histogram
- Elasto Size Compare
- Elasto Strain Ratio
- Volume Flow Area

Tissue depth

Selecting this option in the system preset enables depth to be automatically measured when the first measurement marker appears on the image.

The ***Result*** window shows the distance from a point on the transducer-skin interface to the marker until the first marker is anchored.

NOTE

To configure the tissue depth, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **General** > **Tissue Depth display(2D,M)**.

Distance

- **1 Distance**
- **3 Lengths**
- **Trace**

NOTE

Measurement error is within 5% of the distance you measured for all transducers.

1 Distance

1. Select **Distance** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. Press the **[Set]** key to fix the point. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

3 Lengths

1. Select **Distance** on the touch screen. The start point appears.
2. Draw three straight lines using **[Trackball]**, and press the **[Set]** key.
3. Move the fourth point, and then press the **[Set]** key.
4. The measured value is fixed, and three distances (**D1, D2, D3**) are shown on the ***Result*** window.

Trace

1. Select **Distance** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The end point appears.
3. Move the end point gradually along the circumference of the target object using **[Trackball]**.
4. When the start point and the end point are connected with a line, press the **[Set]** key to complete the measurement.
5. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

NOTE

To configure the distance, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Distance** > **Default method**.

Circumference and Area

- **Ellipse**
- **Trace**
- **Spline**

Ellipse

1. Select **Ellipse** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key. The ellipse appears.
4. Use **[Trackball]** to adjust the height of the ellipse, and press the **[Set]** key again.
   - To increase the height, move **[Trackball]** up and right.
   - To decrease the height, move **[Trackball]** down and left.
5. The measured value is fixed. The two diameters (**D1, D2**), the circumference (**C**), and the area (**A**) are shown on the ***Result*** window.

Trace

1. Select **Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to move the end point gradually along the circumference of the target object.
4. When the start point and the end point are connected with a line, press the **[Set]** key to complete the measurement.
5. The measured value is fixed. The circumference (**C**) and the area (**A**) are shown on the ***Result*** window.

Spline

1. Select **Spline** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The second point appears.
3. Set the third and subsequent points in the same way.
4. Press the **[Set]** key twice at the same point to fix the end point.
5. The measured value is fixed. The circumference (**C**) and area (**A**) are shown on the ***Result*** window.

Angle

- **3 Points**
- **2 Lines**
- **2 Lines (Axis)**
- **3 Lines(BA)**
- **3 Lines(AB)**

Angle 3 Points

1. Select **Angle** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point.
4. Press the **[Set]** key. The third point appears.
5. Use **[Trackball]** to move the third point to the end point of the angle measurement.
6. Press the **[Set]** key. The angle between the two lines appears.
7. The angle (**Angle**) is shown on the ***Result*** window.

Angle 3 Lines

1. Select **Angle** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   TThe first point is fixed, and the second arrow-shaped point appears.
3. Use **[Trackball]** to move the marker to the second point.
4. Draw the baseline, and press the **[Set]** key to fix the baseline.
   The third point appears.
5. Draw the remaining two straight lines to cross the baseline as the same way. The α angle and β angle appear.
6. Press the **[Set]** key at the end point of the third straight line to fix the measured value.
   The two angles (**Alpha, Beta**) are shown on the ***Result*** window.

NOTE

To configure the angle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Angle** > **Default method**.

%Stenosis

- **2 Distances**
- **2 Ellipses**
- **2 Traces**
- **Trace+Ellipse**
- **Ellipse+Trace**

Two diameters percent stenosis calculation

1. Select **%Stenosis** on the touch screen. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters (**D1, D2**) and the diameter percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

Two ellipses percent stenosis calculation

1. Select **%Stenosis** on the touch screen. The start point appears.
2. Measure the outer area (**A1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the inner area (**A2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two ellipses (**A1, A2**) and the diameter percent stenosis (**%Steno(Area)**) are shown on the ***Result*** window.

NOTE

To configure the %Stenosis, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **%Stenosis** > **Default method**.

Volume

- **1 Distance**
- **2 Distances**
- **3 Distances**
- **Ellipse**
- **Distance+Ellipse**

3 Distance volume

1. Select **Volume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When the three distances are measured, the volume is calculated.
5. The measured value is fixed. The three distances (**D1, D2, D3**) and the volume (**Vol**) are shown on the ***Result*** window.

NOTE

When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.

Ellipse

1. Select **Volume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point and press the **[Set]** key. The ellipse appears.
4. Use **[Trackball]** to adjust the height of the ellipse, and press the **[Set]** key again.
   - To increase the height, move **[Trackball]** up and right.
   - To decrease the height, move **[Trackball]** down and left.
5. The measured value is fixed. The two distances (**D1, D2**) and the volume (**Vol**) are shown on the ***Result*** window.

NOTE

To configure the volume, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Volume** > **Default method**.

Disk Volume

- **Trace**
- **Spline**

Trace

1. Select **DiskVolume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to create a trace of the structure with the second point.
4. Press the **[Set]** key to complete the trace.
   The start and end points of the trace are connected, and a line representing the long axis appears.
5. Press the **[Set]** key again. The volume is calculated.
6. The area (**A**), the circumference (**C**), the diameter (**D**), and the volume (**V**) are shown on the ***Result*** window.

Spline

1. Select **DiskVolume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The second point appears.
3. Set the third and subsequent points in the same manner.
4. Press the **[Set]** key twice to complete the trace.
   The start and end points of the trace are connected, and a line representing the long axis appears.
5. Press the **[Set]** key again. The volume is calculated.
6. The area (**A**), the circumference (**C**), the diameter (**D**), and the volume (**V)** are shown on the ***Result*** window.

NOTE

To configure the disk volume, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Disk Volume** > **Default method**.

A/B Ratio

- **2 Distances**
- **2 Ellipses**
- **2 Traces**
- **Ellipse+Trace**
- **Trace+Ellipse**

Two diameters ratio

1. Select **A/B Ratio** on the touch screen. The start point appears.
2. Measure the first diameter (**D1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second diameter (**D2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two distances (**D1, D2**) and A/B ratio (**A/B Ratio**) are shown on the ***Result*** window.

Two ellipses ratio

1. Select **A/B Ratio** on the touch screen. The start point appears.
2. Measure the first area (**A1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second area (**A2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two ellipses (**A1, A2**) and A/B ratio (**A/B Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **A/B Ratio** > **Default method**.

Histogram

HIistogram is a function that the gray scale distribution within a marked Region of Interest (ROI) will be graphically displayed on the screen.

1. Select **Histogram** on the touch screen.
2. Use **[Trackball]** to move the caliper to the corner of the area where you want to measure the histogram.
3. Press the **[Set]** key.
4. Use **[Trackball]** to move the caliper diagonally to the opposite side of the area.
5. Press the **[Set]** key. The measured value is shown on the ***Histogram*** window.
   To view the histogram, go to the ***Histogram*** window.

NOTE

To configure the histogram, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Histogram**.

CAUTION

Do not change the gain control of the 2D image after performing the histogram measurement. Your change may not be applied on the histogram.

Elasto Size Compare

Elasto Size Compare applies the measured data in 2D mode to Elastography mode. Size of lesion in 2D mode and Elastography mode can be compared to have more accurate diagnose result.

NOTE

For details, see "Elasto Size Compare" on page 11-44.

Elasto Strain Ratio

Elasto Strain Ratio provides quantitative information. It is calculated by comparing the strain of a lesion to the surrounding normal tissue. Soft tissue will have higher strain values than stiff tissue. It is displayed as a real-time color map of the relative elasticity.

NOTE

For details, see "Elasto Strain Ratio" on page 11-45.

Volume Flow Area

- **Distance**

1. Select **Volume Flow Area** on the touch screen.
2. Use **[Trackball]** to move the marker to the start point.
3. Press the **[Set]** key to fix the point. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The measured value is fixed, and the volume flow area is shown on the ***Result*** window.

NOTE

- To calculate volume flow measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **Modify Calcs** and check Volume Flow from Semi Auto Trace or Auto Trace(Calc). Then, perform Auto Trace or Semi Auto Trace measurement in Doppler mode.
- To configure the volume flow method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **Vol.flow Method**.

M mode measurements

The basic M mode measurements include the following measurement parameters:

- Distance
- Time
- Slope
- %Stenosis
- Heart rate (HR)
- A/B Ratio

Distance

- **1 Distance**
- **3 Lengths**

1 Distance

1. Select **Distance** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

3 Lengths

1. Select **Distance** and then select **3 Lengths** on the touch screen.
   The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
3. Draw the first straight line using **[Trackball]**, and press the **[Set]** key.
4. Draw the second straight line using **[Trackball]**, and press the **[Set]** key.
5. Draw the third straight line using **[Trackball]**, and press the **[Set]** key to complete the measurement.
6. The measured value is fixed, and three distances (**D1**, **D2**, **D3**) are shown on the ***Result*** window.

NOTE

To configure the distance, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Distance** > **Default method**.

Time

1. Select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

%Stenosis

Two diameters percent stenosis calculation

1. Select **%Stenosis** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the larger vertical diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller vertical diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The diameters (**D1, D2**) and the diameter percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

NOTE

For diameter calculation, do not take a distance measurement from a longitudinal view. This may lead to an inaccurate assessment of %stenosis.

A/B Ratio

- **Distance**
- **Time**

Distance ratio

1. Select **A/B Ratio** and then select **Distance** on the touch screen. The start point appears.
2. The vertical line and the horizontal line are perpendicular to each other.
3. Measure the first vertical diameter (**D1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. Measure the second vertical diameter (**D2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
5. The ratio is calculated. The two distances (**D1, D2**) and A/B ratio (**Distance Ratio**) are shown on the ***Result*** window.

Time ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Time** on the touch screen. The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first horizontal diameter (**T1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second horizontal diameter (**T2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two distances (**T1, T2**) and A/B ratio (**Time Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS. > A/B Ratio > Default method**.

Heart Rate (HR)

1. Select **HR** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the HR cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

The basic D mode measurements include the following measurement parameters:

- Velocity
- Time
- Acceleration
- Resistivity Index (RI)
- Pulsatility Index (PI)
- VTI
- Heart Rate (HR)
- A/B Ratio
- S/D Ratio
- AC/DC
- PHT
- Auto Calc
- Auto Trace/Semi Auto Trace/Trace

Velocity

1. Select **Velocity** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed. The velocity (**Vel**) and pressure gradient (**PG**) are shown on the ***Result*** window.

Time

1. Select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The velocity (**Vel**) and time (**T**) are shown on the ***Result*** window.

Acceleration

1. Select **Acceleration** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the acceleration is calculated. The acceleration (**Accel**), the acceleration time (**AT**), and maximum velocity (**Vmax**) are shown on the ***Result*** window.

Resistivity Index (RI)

1. Select **RI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The peak systolic velocity (**PS**), end diastolic velocity (**ED**), and resistivity index (**RI**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Move the marker to the start point of the waveform using **[Trackball]**, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated.
5. The peak systolic velocity (**PS**), end diastolic velocity (**ED**), minimum diastolic velocity (**MD**), the maximum time-average velocity (**TAmax**), the resistivity index (**RI**), the pulsatility index (**PI**), and systole/diastole ratio (**S/D**) are shown on the ***Result*** window.

Velocity-Time Integral (VTI)

1. Select **VTI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Move the marker to the start point of the waveform using **[Trackball]**, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The velocity-time integral is calculated. The minimum, maximum, mean velocities (**Vmin, Vmax, Vmean**) and maximum and mean pressure gradients (**PGmax, PGmean**) are shown on the ***Result*** window.

A/B Ratio

- **Velocity**
- **Time**

Velocity ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Velocity** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**V1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**V2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**V1, V2**) and A/B ratio (**Velocity Ratio**) are shown on the ***Result*** window.

Time ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first time interval (**T1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second time interval (**T2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two time values (**T1, T2**) and A/B ratio (**Time Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **A/B Ratio** > **Default method**.

AC/DC

1. Select **AC/DC** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first oblique line (**Accel**) of the slope using **[Trackball]**, and press the **[Set]** key.
3. Measure the second oblique line (**Decel.**) of the slope using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The acceleration index (**Accel**), the acceleration time (**AT**), the deceleration index (**Decel.**), and deceleration time (**DT**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

Auto Calc

1. In PW mode, select **Auto Calc** on the touch screen.
2. Select **Frozen** or **Live**.
3. If you select **Live**, the caliper and waveform trace automatically appear.
4. If you select **Frozen**, press the **[Freeze]** key on the control panel to freeze the image.
   The caliper and waveform trace automatically appear.
5. The calculated value is shown on the ***Result*** window.

Auto Calc options

- **Method**: Select a trace method for Doppler spectrum.
- **Direction**: Select a trace direction for Doppler spectrum.

NOTE

- To configure the auto trace options, press the **[Image Preset]** key and go to **General**.
- To measure the maximum velocity, select **Below** or **Above** for the trace direction.
- To edit the trace, use **[Trackball]**.

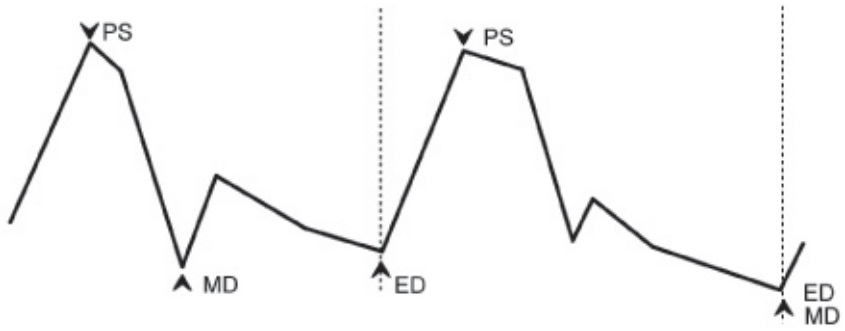


Figure 8-3 Doppler

Auto Trace

1. In PW mode, select the desired measurement item and then select **Auto Trace** on the touch screen.
   The Doppler spectrum is traced automatically and the results are displayed.
2. If necessary, adjust the calculation cycle using **[Trackball]** and the **[Caliper]** key on the control panel.
   a. A green line appears at the right of the spectrum.
   b. Using **[Trackball]**, move the line and readjust the end cycle.
   c. Press the **[Caliper]** key on the control panel.
      The line changes to gray.
   d. A green line appears at the left of the spectrum.
   e. Using **[Trackball]**, move the line and readjust the start cycle.
   f. Press the **[Set]** key on the control panel. The line changes to gray.
3. The calculated value is shown on the ***Result*** window.

NOTE

To configure the auto trace options, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **Modify Calcs** > **Auto Trace(Calc)**.

Semi Auto Trace

1. In PW mode, select the desired measurement item and then select **Semi Auto Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point of the waveform and press the **[Set]** key. The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The calculated value is shown on the ***Result*** window.

NOTE

To configure the semi auto trace, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **Modify Calc** > **Semi Auto Trace**.

Manual Trace

1. In PW mode, select the desired measurement item and then select **Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point of the waveform and press the **[Set]** key. The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The calculated value is shown on the ***Result*** window.

NOTE

To configure the manual trace, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **Modify Calc** > **Manual Trace**.

Measurement Accuracy

The measurement values should always be accurate according to measuring caliper and point.

Despite the high technical accuracy of the scan geometry and the measuring system of the X-CUBE 70 expert equipment, one must, however, be aware of inaccuracies caused by the ultrasound beam properties and the physiological properties of the scanned structures, tissues and fluids.

For the reason of improved lateral resolution you should choose the proper scan head for the depth range of the structure to be measured.

Table 8-4 Measurement accuracy

Mode	Measurement		Accuracy
2D	Depth		≤ 5 %
	Distance		≤ 5 %
	Circumference	Ellipse	≤ 5 %
		Trace	≤ 5 %
	Area	Ellipse	≤ 5 %
		Trace	≤ 5 %
M	Time		≤ 5 %
D	Velocity (30–70 cm/s)		≤ 15 %
CF	Velocity		≤ 15 %

Calculation accuracy

Estimate the overall inaccuracy of a combined measurement and calculation by including the stated inaccuracy from the basic measurement accuracy statements.

Calculation formulas and databases are provided as a tool to assist the user, but should not be considered an undisputed database, in making a clinical diagnosis. The user is encouraged to research the literature and judge the equipment capabilities on an ongoing basis in order to assess its utility as a clinical tool.

Patient Worksheets (Reports)

In X-CUBE 70, a report can be generated based on the tests performed and the results analyzed during the examination. This report is generated using pre-selected templates and data stored in the system.

To enter the ***Report*** screen, do one of the following:

– Touch **Report** on the touch screen.

– Select **Report** on the context menu.

Report Screen Display

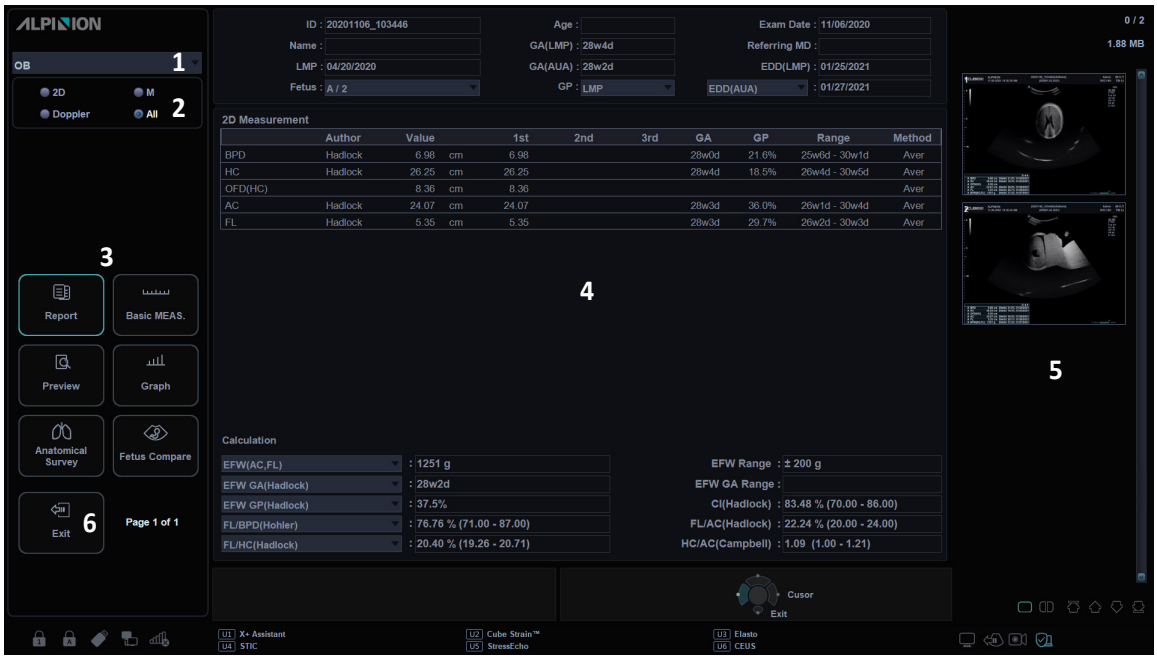


Figure 8-4 Report Screen Display (OB)

1	Measurement application selection	**4**	Worksheet
2	Measurement mode selection	**5**	Image clipboard
3	Function selection	**6**	Exit

Report Touch screen and Controls

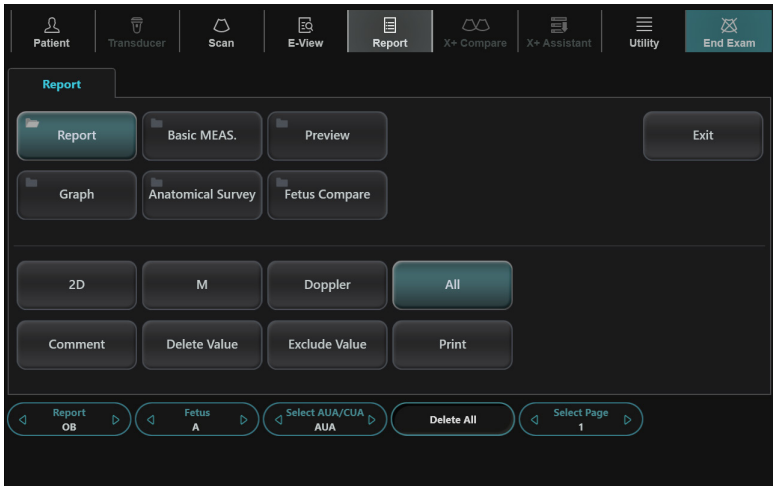


Figure 8-5 Report Touch Screen (OB)

Table 8-5 Report/Worksheet controls

Controls	Description
Report	Access Worksheet page.
Basic MEAS.	View a worksheet of basic measurement.
Preview	Preview the report in print layout.
Graph	Access OB Graph page (applies only to OB).
Anatomical Survey	Access Anatomical Survey page (applies only to OB).
Fetus Compare	Compare between fetuses by viewing measurement and calculation values.
2D/M/Doppler	View a worksheet with data for a particular mode (2D, M, or Doppler).
All	View a worksheet with data for more than one mode.
Comment	View or edit comments.
Delete Value	Delete the current measurement value.
Exclude Value	Exclude or include measurement value.
Print	Print out the report to the default printer.
Select AUA/CUA	Select the ultrasound age calculation method (applies only to OB).
Delete All	Delete all measurement values for all modes from the report.
Select Page	View the next page.
Exit	Exit the ***Report*** screen.

Activating a Worksheet

When the measurement is complete, all measurement results are recorded in the application-specific patient worksheet.

The worksheet feature allows you to review, edit, delete, or print data from reports. All measurements and calculations performed during the inspection can be reviewed at any time using the worksheet.

Figure 8-6 Worksheet Display

1	Patient information	**4**	Measured values
2	Measurement information	**5**	Value type: Average, Max, Min or Last
3	Calculation information		

Viewing a worksheet

To view a worksheet, do one of the following:

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

The system displays the worksheet for the current exam.

To view a worksheet of basic measurement,

– Select **Basic MEAS.** on the touch screen.

To view a worksheet by application or measurement mode,

– Select an application or a mode from the corresponding list or field on the top left of the display.
  - To view a worksheet with data for a particular mode, select a mode (**2D, M**, or **Doppler**) on the touch screen.
  - To view a worksheet with data for more than one mode, select **All** on the touch screen.

If a worksheet has more data on a second page, to view the next page,

– Rotate the **Select Page** soft key.

Exiting the worksheet

To exit Worksheet page and return to the scan mode, do one of the following:

– Press the **Exit** key on user-defined key.

– Select **Exit** on the touch screen.

Editing a Worksheet

Some fields on the worksheet are view-only, and others you can select or change. Use the trackball to easily see which fields you can select or change. When the cursor moves over a field that can be selected or changed, the field is highlighted.

NOTE

What you see on the screen varies depending on the selected measurement package.

Changing the report data

To change the measurement value,

1. Use **[Trackball]** to move the cursor to the field that you want to change.
   The field is highlighted.
2. Press the **[Set]** key. The field backlights.
3. Type the new data in the field.
   The new data is displayed in green with an asterisk mark.

   NOTE

   The new data, displayed in green with an asterisk mark, is appended to the updated value and resultant value to indicate that it was manually entered.

Deleting the report data

To delete measurement values,

1. Use **[Trackball]** to move the cursor to the field that you want to erase. The field is highlighted.
2. Do one of the following:
   - Select **Delete Value** to delete the current value.
   - Press the **Delete All** soft key to delete all values for all measurement modes from the report.
   - Press the **[Clear]** key on the control panel to delete all measurement values from the report.

Excluding/Including the report data

If you select a particular value on the report and select **Exclude Value**, the value is excluded from the result row, the resultant value is recalculated without the value, and the calculated values using the value is blank.

To exclude or include measurement values,

1. Use **[Trackball]** to move the cursor to the field that you want to exclude.
   The field is highlighted.
2. Do one of the following:
   - Select **Exclude Value** to exclude the data. The excluded data is displayed in white.
   - Select **Exclude Value** again to include the data that you previously excluded.

Selecting a type of value

To select a method,

1. Use **[Trackball]** to move the cursor over the value in the Method column and press the **[Set]** key.
2. Select a method from the drop-down list.
   - **Last**: Last measurement that was taken
   - **Aver**: Average of the measurements taken
   - **Max**: Maximum measurement
   - **Min**: Minimum measurement
3. The selected method is displayed in the column, and the value is updated accordingly.

Adding comments

To type a comment,

1. Select **Comment** on the touch screen. The ***Comment*** screen appears.
2. In the ***Comments*** field, type comments about the exam by using the QWERTY keyboard.
3. To close the ***Comment*** screen, click **OK** or select **Comment** on the touch screen.

NOTE

On the ***Patient*** screen, you can edit text in the ***Exam Comments*** field.

Printing a Report

Reports summarize data obtained in the examination. They can contain data and images.

Once generated, the report can be viewed, and images can be added. The examination data itself cannot be modified. Use the worksheet to review and adjust the data before generating the report.

The completed report can be printed on a standard printer.

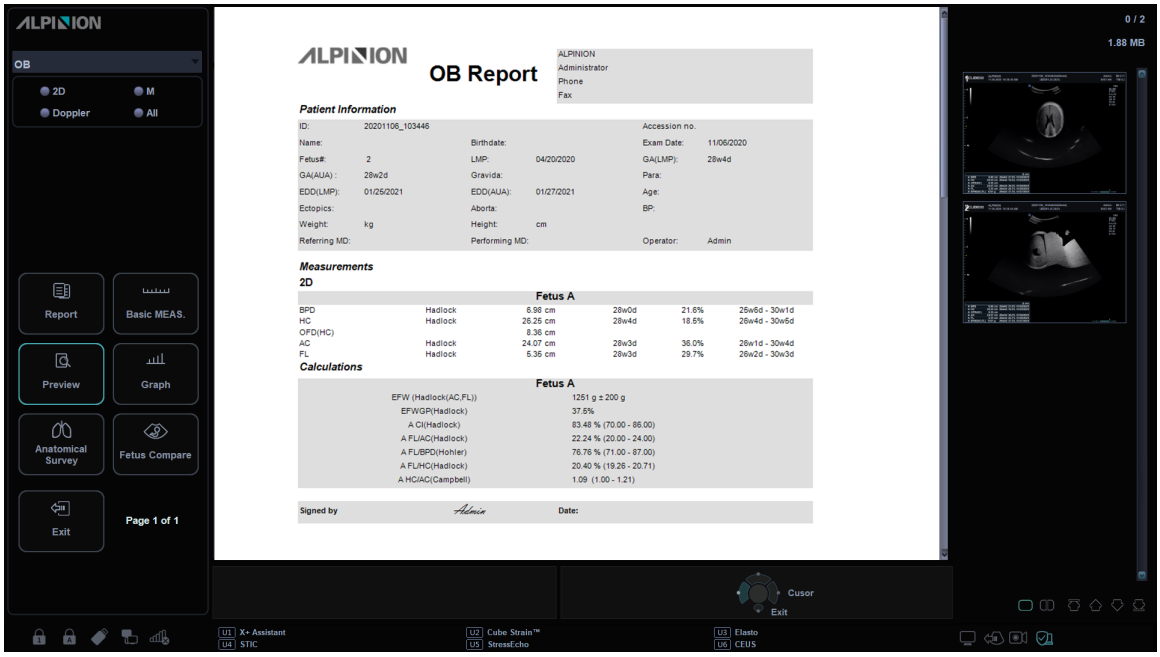


Figure 8-7 Report Preview (OB)

Previewing the report

It provides report preview before print-out.

To preview the report in print layout,

– Select **Preview** on the touch screen, or select **Preview** on the context menu.
You can preview a report to be printed.

Images in the report

To add an image to the report,

1 Move the cursor to the desired image on the clipboard and press the **[Set]** key.

2 Move the cursor where the selected image is to be inserted and press the **[Set]** key.

To remove an image from the report,

– Move the cursor to the desired image on the report and select **Delete Image** on the touch screen.

To add image pages to the report,

– Select **Add Image Page** on the touch screen.

To delete image pages from the report,

– Select **Delete Image Page** on the touch screen.

To add all the images on the clipboard the report,

– Select **Add Image All** on the touch screen.

NOTE

You cannot add more than 10 image pages to a report.

Exporting the report to media

To export the report to storage media as PDF format,

1. Select **PDF Export** on the touch screen. The ***Save*** dialog box appears.
2. Select a media from the ***Device*** field.
3. Type a file name in the ***File Name*** field.
4. Click **Save**. The progress bar appears during exporting files.

Printing a report

To print a report via a standard printer,

– Select **Print** on the touch screen.

To capture the ***Report*** screen,

– Press the **[P1]**, **[P2]**, **[P3]** or **[P4]** key on the control panel.

NOTE

- A default standard printer can be configured in **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral** > **Standard Printer**.
- The supported paper size for report is A4, Letter only.

Transfering the report data

You can transfer a measured data via the RS232C port. This function is only available for OB and GYN reports, and anatomical survey.

To transfer the measured data,

1. Go to **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral** > **RS232C** > **COM** and select the **Transfer Measurement** from the drop-down list.
2. From the ***Report*** screen, select **Transfer** on the context menu.
   When the data is being transferred, the progress bar indicating the transfer appears on the display.

9

Application Measurements and Calculations

This chapter describes how to perform application specific measurements, calculations and report functions.

Abdomen

Abdomen Measurements and Calculations

2D mode measurements

2D mode measurements display in the context menu and the abdomen report with measured result, when assigned.

Table 9-1 2D mode measurement (Abdomen)

Measurement	Description
Aorta	Aorta Diameter
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Renal Vol	Renal Volume
Aorta	Aorta
Renal A	Renal Artery
Hepatic A	Hepatic Artery
Portal V	Portal Vein
Splenic A	Splenic Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Vessel	Vessel
Volume Flow Area	Volume Flow Area
%Stenosis	Stenosis
Volume	Volume
A/B Ratio	A/B Ratio

NOTE

To configure the 2D mode measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Abdomen** > **2D** > **Default Measurement**.

Aorta Diameter

1. Select **Aorta** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the aorta diameter (**Aorta**) is shown on the ***Result*** window.

Renal Length

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal L**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the renal length (**Rt** or **Lt Renal**) is shown on the ***Result*** window.

Renal Volume (1)

You can measure the length, width, and height for the left and right renal. Each measurement is a typical distance measurement made in appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurement is completed, the renal volume is calculated.
5. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the renal volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Abdomen** > **Renal Vol** > **Edit**.

M mode measurements

M mode measurements display in the context menu and the abdomen report with measured result, when assigned.

Table 9-2 M mode measurement (Abdomen)

Measurement	Description
HR	Heart Rate

NOTE

To configure the M mode measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Abdomen** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the abdomen report with measured result, when assigned.

Table 9-3 D mode measurement (Abdomen)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
Hepatic A	Hepatic Artery
IVC	Inferior Vena Cava
Hepatic V	Hepatic Vein
Mid HV	Middle Hepatic Vein
MPV	Main Portal Vein
Portal V	Portal Vein
Splenic A	Splenic Artery
Splenic V	Splenic Vein
SMA	Superior Mesenteric Artery
SMV	Superior Mesenteric Vein
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Iliac V	Iliac Vein
Vessel	Vessel
Renal V	Renal Vein
HR	Heart Rate

NOTE

To configure the Doppler mode measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Abdomen** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements.

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the package measurements for D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Abdomen** > **Doppler** > **Package measurement** (double-click) > a default measurement.

Peak Systole, End Diastole, or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu. The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points is displayed. The acceleration time (**AT**) is shown on the ***Result*** window.

Shear Wave Elasto mode measurements

Shear Wave Elasto mode measurements display in the context menu and the abdomen report with measured result, when assigned.

Table 9-4 Shear Wave Elasto mode measurement (Abdomen)

Measurement	Description
Point Shearwave Elasto	Point Shearwave Elasto
S #1–12	Sample #1–12

Abdomen Report

The Abdomen report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the measurement value type, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Obstetrics

Obstetric Measurements and Calculations

2D mode measurements (OB1, OB2/3)

2D mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 9-5 2D mode measurement (OB)

Measurement	Description
Fetal Biometry	Fetal Biometry (Package)
BPD	Biparietal Diameter
HC	Head Circumference
AC	Abdominal Circumference
FL	Femur Length
Humerus	Humerus Length
AD	Abdominal Diameter
OFD	Occipito-frontal Diameter
APAD	Anteroposterior Abdominal Diameter
TAD	Transverse Abdominal Diameter
MAD	Middle Abdomen Diameter
FTA	Fetal Trunk Cross-Sectional Area
APTD	Antero-Posterior Trunk Diameter
TTD	Transverse Trunk Diameter
ThC	Thoracic Circumference
Early Gestation	Early Gestation (Package)
CRL	Crown-Rump Length
GS	Gestation Sac Length
YS	Yolk Sac Length
BPD	Biparietal Diameter
AC	Abdominal Circumference
FL	Femur Length
NT	Nuchal Translucency Length
NB	Nasal Bone Length
IT	Intracranial Translucency

Measurement	Description
MSD	Mean Gestational Sac Diameter
Fetal Long Bones	Fetal Long Bones (Package)
Humerus	Humerus Length
Radius	Radius Length
Ulna	Ulna Length
Tibia	Tibia Length
Fibula	Fibula Length
FL	Femur Length
CLAV	Clavicle Length
SL	Spinal Length
Fetal Cranium	Fetal Cranium (Pacakge)
CM	Cisterna Magna
BOD	Binocular Distance
NT	Nuchal Translucency Length
NB	Nasal Bone Length
CEREB	Transverse Cerebellar Diameter
IOD	Inner Orbital Diameter
Va	Anterior Horn Lateral Ventricular Width
Vp	Posterior Horn Lateral Ventricular Width
HEM	Hemisphere Width
CSP	Cavum Septum Pellucidum
NF	Nuchal Fold
IT	Intracranial Translucency
Lat Vent	Lateral Ventricle
FMF angle	Frontomaxillary Facial Angle
Fetal Others	Fetal Others (Package)
Foot	Foot Length
Ear	Ear
Umbilical V	Umbilical Vein
MP	Middle Phalanx
Renal L	Renal Length
Renal AP	Renal Anterior-Posterior Diameter

Measurement	Description
Pelvis	Pelvis
Cardiac Axis	Cardiac Axis
Placenta Thick.	Placenta Thickness
AFI	Amniotic Fluid Index
Q1	Quadrant 1
Q2	Quadrant 2
Q3	Quadrant 3
Q4	Quadrant 4
MVP	Maximal Vertical Pocket
CTAR	Cardio-Thoracic Area Ratio (Package)
ThD ap	Anterior-Posterior Thoracic Diameter
ThD trans	Transverse Thoracic Diameter
HrtD ap	Anterior-Posterior Heart Diameter
HrtD trans	Transverse Heart Diameter
Thorax area	Thoracic Area
Heart area	Heart Area
Maternal Others	Maternal Others (Package)
Uterus	Uterus Volume
Ovary	Ovary Volume
Cervix L	Cervix Length
Placenta Thick.	Placenta Thickness
Fibroid	Fibroid
Cyst	Cyst
LL	Liver Length
RL	Rib Length
Scapular	Scapular Length
SC	Splenic Circumference
FB	Fetal Bowel Diameter
OOD	Outer Orbital Diameter
HA	Head Area
AA	Abdominal Area
Umb. A Diam.	Umbilical Artery Diameter

Measurement	Description
APTD-TTD	Anteroposterior Trunk Diameter & Transverse
AxT	Anteroposterior Trunk Diameter multiplied Diameter
CTAR	Cardiothoracic Area Ratio
Ovary	Ovary Volume
Ovary L	Ovary Length
Ovary H	Ovary Height
Ovary W	Ovary Width
Ovary Vol	Ovary Volume

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **Default Measurement**.

2D mode measurements (Fetal Echo)

2D mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 9-6 2D mode measurement (Fetal echo)

Measurement	Description
4-Chamber-view	4 chamber view (Package)
Ventr. L	Ventricle Length
Ventr. W	Ventricle Width
Atrial L	Atrial Length
Atrial W	Atrial Width
Ventr. inl.	Ventricle Inlet Diameter
Ventr. Area	Ventricle Area
Wall Thick.	Wall thickness
Septum	Septum
TV orifice	Tricuspid Valve Orifice
MV orifice	Mitral Valve Orifice
Aortic Arch	Aortic Arch (Package)
Anulus	Anulus
Asc. aorta Diam.	Ascending Aorta Diameter
Desc. aorta Diam.	Descending Aorta Diameter
LVOT	Left Ventricular Outflow Tract (Package)
LVOT Diam.	Left Ventricular Outflow Tract Diameter
Outflow track	Outflow Track (Package)
PA	Pulmonary Artery
PV width	Pulmonary Valve width
Main PA	Main Pulmonary Artery
AV width	Aortic Valve width
Ao. root Diam.	Aortic Root Diameter
Ao. trunk Dim.	Aortic Trunk Diameter
Art. duct Diam.	Arterial Duct Diameter
RVOT	Right Ventricular Outflow Tract (Package)
RVOT Diam.	Right Ventricular Outflow Tract Diameter
Thorax	Thorax (Package)

Measurement	Description
Heart diagonally	Heart diagonally
Thorax diagonally	Thorax diagonally
Cardiac Circum.	Cardiac Circumference
Thoracic Circum.	Thorax Circumference
Heart Area	Heart area
Thorax Area	Thorax area
Cardiac Axis	Cardiac axis
Venous	Venous (Package)
SVC	Superior Vena Cava Diameter
IVC	Inferior Vena Cava Diameter
Heart	Heart (Package)
LA Diam.	Left Atrium Diameter
LA L	Left Atrium Length
LVLd-A4C	Left Ventricle - Diastolic major axis Dimension - Apical four chamber
LVLs-A4C	Left Ventricle - Systolic major axis Dimension - Apical four chamber
LVLd-A2C	Left Ventricle - Diastolic major axis Dimension - Apical two chamber
LVLs-A2C	Left Ventricle - Systolic major axis Dimension - Apical two chamber
LVOT Diam.	Left Ventricle Outflow Track - Cardiovascular Orifice Diameter
RA Diam.	Right Atrium Diameter
RA L	Right Atrium Length
RVAWd	Right Ventricle - Anterior Wall Diastolic Thickness
RV L	Right Ventricle Length
RVDd	Right Ventricle Diameter - End Diastole
RVDs	Right Ventricle Diameter - End Systole
RVOT Diam.	Right Ventricle Outflow Track - Cardiovascular Orifice Diameter
Teichholz	Left Ventricular Dimensions by Teichholz method (Package)
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole

Measurement	Description
CT	Cardiothoracic Area Ratio (Package)
Cardiac Area	Cardiac Area
Thoracic Area	Thoracic Area
Arteries	Arteries Package
Ao. arch Diam.	Aortic Arch Diameter
Aorta Diam.	Aorta Diameter
Asc. aorta Diam.	Ascending Aorta Diameter
Thor. aorta Diam.	Thoracic Aorta Diameter
Trans. ao. arch Diam.	Transverse Aortic Arch Diameter
Duct. arch Diam.	Ductal Arch Diameter
DA Diam.	Ductus Arteriosus Diameter
Isthmus	Isthmus
PA Diam.	Pulmonary Artery Diameter
Lt. PA Diam.	Pulmonary Artery Diameter - Systole - Left
Rt. PA Diam.	Pulmonary Artery Diameter - Systole - Right
Umb. A Diam.	Umbilical Artery Diameter
Veins	Veins Package
SVC Diam.	Superior Vena Cava Diameter
IVC Diam.	Inferior Vena Cava Diameter
Lt. PV Diam.	Pulmonary Vein Diameter - left
Rt. PV Diam.	Pulmonary Vein Diameter - right
Umb. V Diam.	Umbilical Vein Diameter

Gestational Sac (GS)

1. Select **GS** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the gestational sac length is shown on the ***Result*** window.

Abdominal Circumference (AC)

1. Select **AC** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Move the marker to the second point using **[Trackball]**. The ellipse appears.
4. Press the **[Set]** key. The end point appears.
5. Move the marker to the second point using **[Trackball]**, and press the **[Set]** key again.
6. The measured value is fixed, and the abdominal circumference is shown on the ***Result*** window.

NOTE

You can measure the abdominal circumference by using the trace. To change the measurement method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **AC** > **Edit** > **Caliper Type**.

Biparietal Diameter (BPD)

1. Select **BPD** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the biparietal diameter is shown on the ***Result*** window.

Head Circumference (HC), Occipito-frontal Diameter (OFD)

1. Select **HC** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point. The ellipse appears.
4. Press the **[Set]** key. The end point appears.
5. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
6. The measured value is fixed. The head circumference and the occipito-frontal diameter are shown on the ***Result*** window.

NOTE

- To show or hide the OFD measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **HC** > **Edit**. This setting is available only when you perform a HC measurement by using the ellipse.
- You can measure the head circumference by using the trace. To change the measurement method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **HC** > **Edit** > **Caliper Type**.

Femur Length (FL)

1. Select **FL** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the femur length is shown on the ***Result*** window.

X+ Auto Biometry

To measure the fetal biometry automatically,

1. Select the **Fetal Biometry** folder on the touch screen.
2. Select the desired measurement (e.g. BPD, HC, AC, FL or Humerus).
   The trace is generated automatically on the display, and the calculation process starts.
3. The measured value is fixed, and the result is shown on the ***Result*** window.
   If the result is not correct, rotate the **Mode** soft key to select **Manual**, and then proceed with manual measurement.
4. To complete the measurement, press the **[Set]** key.
   The measured value is fixed and summarized in the report.

NOTE

If the system was not able to detect the anatomy automatically, the following message appears in the message area: "No valid Auto measurement was found. Please proceed with manual measurement."

Nuchal Translucency (NT)

To measure the NT manually,

1. Select **NT** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the thickness of the nuchal translucency (**NT**) is shown on the ***Result*** window.

Automatic Nuchal Translucency Diameter (Auto NT)

To measure the NT automatically,

1. Acquire the magnified mid-sagittal view of the fetus by pressing the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **Auto NT** on the touch screen. The start point appears.

   NOTE

   According to the fetal position, you can select **Face Up** or **Face Down** by rotating the **NT Position** soft key.
4. Use **[Trackball]** to move the marker to the start point, and then press the **[Set]** key to fix the marker. The second point appears.
5. Use **[Trackball]** to move the marker at the diagonal edge of the NT ROI to the end point, and then press the **[Set]** key.
   The nuchal translucency diameter (**NT**) is shown on the ***Result*** window.
6. To complete the measurement, press the **[Set]** key.
   The measured value is fixed and summarized in the report.

   NOTE

   The Auto NT value is shown with an apostrophe mark (') on the worksheet.

To measure the NT manually,

– Select **Manual** by rotating the **Caliper** soft key, and make one distance measurement.

NOTE

After the automatic measurement is completed, you can make one distance measurement manually, if necessary, to cross check the result.

Spinal Length (SL)

1. Select **SL** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the length of vertebrae is shown on the ***Result*** window.

Amniotic Fluid Index (AFI)

To calculate the amniotic fluid index, measure the four quadrants of the uterine cavity.

1. Select the **AFI** folder on the context menu.
2. Select **AFI-Q1**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The first quadrant is completed.
3. Perform 1 distance measurement.
   The AFI sum for AFI-Q1 is automatically shown on the ***Result*** window.
4. Repeat step 3 to measure the second, third, and fourth quadrant (AFI-Q2, AFI-Q3, AFI-Q4).
5. The total sum of your AFI measurements is shown on the ***Result*** window.

CTAR

1. Select **CTAR** on the context menu. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to move the marker to the second point. The ellipse appears.
   c. Press the **[Set]** key. The end point appears.
   d. Use **[Trackball]** to move the marker to the second point and press the **[Set]** key again. The heart area (**Heart Area**) measurement is completed.
2. Perform the thoracic area (**Thorax Area**) measurement in the same manner (a-d).
3. When two ellipse measurements are completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

NOTE

The cardiothoracic area ratio measurement is available for the OB1 preset and OB2/3 presets (CTAR), and Fetal Echo preset (CT).

Antero-Postero Trunk Diameter by Transverse Trunk Diameter (AxT)

1. Select **AxT** on the context menu. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The antero-postero trunk diameter (**APTD**) measurement is completed.
2. Perform the measurement of the transverse trunk diameter (**TTD**) measurement in the same manner (a-d).
3. When two distance measurements are completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Diastole – IVSd, LVIDd, LVPWd**
- **Systole – IVSs, LVIDs, LVPWs**

1. Select the **Teichholz(2D)** folder on the context menu.
2. Select **Diastole** or **Systole**. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball]**, the second point and a straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

2D mode calculations (OB1, OB2/3)

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-7 2D mode calculations (OB)

Calculation label	Description	Required measurements
EFW	Estimated Fetal Weight	The required measurements vary depending on the selected authors.
EFW GP	Estimated Fetal Weight - Growth Percentile	The values vary depending on the selected authors.
GA	Gestational ages by last menstrual period	Calculation from the LMP data
EDD	Estimated date of delivery by last menstrual period	Determined by LMP data
U/S GA	Gestational ages by ultrasound	Determined from all Fetal Age measurements and calculations
U/S EDD	Estimated date of delivery by ultrasound	Determined from all ultrasound measurements and calculations
CI	Cephalic Index	BPD OFD
HC/AC	Ratio of Head Circumference to Abdominal Circumference	HC AC
FL/BPD	Ratio of Femur Length to Biparietal Diameter	FL BPD
FL/AC	Ratio of Femur Length to Abdominal Circumference	FL AC
FL/HC	Ratio of Femur Length to Head Circumference	FL HC

2D mode calculations (Fetal Echo)

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-8 2D mode calculations (Fetal echo)

Calculation Label	Description	Required
Teichholz	Teichholz	
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
EF	Ejection Fraction	EDV, ESV
LV FS	Fractional Shortening	LVIDd, LVIDs
CT	Cardiothoracic Area Ratio	CA, TA
Thorax	Thorax	
CTR	Cardio-Thoracic Ratio	Heart diagonally, Thorax diagonally
CTCR	Cardio-Thoracic Circumference Ratio	Cardiac Circum., Thoracic Circum.
CTAR	Cardio-Thoracic Area Ratio	Heart area, Thorax Area

Define as:

- **Teichholz Method**

  $EDV = 7x(LVIDd^3) / (2.4 + LVIDd)$

  $ESV = 7x(LVIDs^3) / (2.4 + LVIDs)$

  SV= EDV – ESV

  EF= (EDV - ESV) / EDV

  FS= (LVIDd - LVIDs) / LVIDd

- **EFW Authors**

  Campbell (AC)

  Hadlock (AC, BPD)

  Hadlock 1 (AC, FL)

  Hadlock 2 (BPD, AC, FL)

  Hadlock 3 (HC, AC, FL)

  Hadlock 4 (BPD, HC, AC, FL)

  Hansmann (BPD, TTD)

  Merz (AC, BPD)

Osaka	(BPD, FTA, FL)
Persson	(BPD, MAD, FL)
Schild	(HC, AC, FL)
Shepard	(AC, BPD)
Shinozuka 1	(BPD, APTD, TTD, FL)
Shinozuka 2	(BPD, FL, AC)
Shinozuka 3	(BPD, APTD, TTD, SL)
Tokyo	(BPD, APTD, TTD, FL)
Interbrowth21st	(AC, HC)

NOTE

- To change the default EFW author, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **OB MEAS.** > **EFW Formula**.
- If a measurement of EFW formula is not shown on the context menu, the EFW formula setting may not be affected. This setting is only available when you set the measurement for EFW formula as default.
- To add a measurement in the EFW formula as default, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **Add measurement** (Insert).

Estimated Fetal Weight (EFW)

1. To measure estimated fetal weight, perform several OB measurements first.
2. EFW based on the measured values is calculated and the result is shown.

   NOTE

   The EFW calculation method (author) is selected from the EFW formula.
3. Perform the measurements required for EFW.
   When the measurements are completed, the EFW is automatically calculated.
4. The each measurement and the estimated fetal weight are shown on the ***Result*** window.

NOTE

EFW is not calculated and shown if the selected measurement is not performed.

Composite Gestational ages (GA) and estimated date of delivery (EDD) by ultrasound

When you perform the OB measurement, GA and EDD are calculated based on the measured values.

NOTE

To show or hide GA and EDD, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **Edit**.

M mode measurements (OB1, OB2/3)

M mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 9-9 M mode measurement (OB)

Measurement	Description
Generic	Generic (Package)
Dist	Distance
Slope	Slope
Time	Time
HR	Heart Rate
%Steno(Dist)	Two Distances Percent Stenosis
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

M mode measurements (Fetal Echo)

M mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 9-10 M mode measurement (Fetal echo)

Measurement	Description
4 Chamber view	4-Chamber-view (Package)
Ventr. Dim.	Ventricle Dimension
Ventr. wall	Ventricle Wall
Atr. Dim.	Atrium Dimension
Septum	Septum Dimension
Biventric. inner	Biventricle inner Dimension
Biventric. outer	Biventricle outer Dimension
MV open exc.	Mitral Valve Open
TV open exc.	Tricuspid Value Open
Outflow track	Outflow Track (Package)
AV Diam.	Aortic Valve Diameter
PV Diam.	Pulmonary Valve Diameter
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate
Heart	Left Heart Package (Package)
LA Diam.	Left Atrium Diameter
AO Diam.	Aorta Diameter - Systole
LVET	Left Ventricle Ejection Time
DE Amp Slope	D-E wave Amplitude and Slope
EF Slope	E-F wave Slope
RADs	Right Atrium Diameter - Systole
RADd	Right Atrium Diameter - Diastole
RVAWd	Right Ventricle Anterior Wall Diameter - Diastole
RVAWs	Right Ventricle Anterior Wall Diameter - Systole
RV Diam.	Right Ventricle Diameter
PA Diam.	Pulmonary Artery Diameter
RVET	Right Ventricle Ejection Time

Measurement	Description
Teichholz	Left Ventricular Dimensions by Teichholz method (Package)
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole

Diameter

The followings are distance measurements:

- **Heart – LA Diam., AO Diam., RADs, RADd, RVAWd, RVAWs, RV Diam., PA Diam.**

1. Select the **Heart** folder on the context menu.
2. Select a distance measurement on the context menu. The start point appears. The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key. The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set**] key again.
5. The measured value is fixed, and the distance measurement is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Heart – LVET, RVET**

1. Select the **Heart** folder on the context menu.
2. Select a time measurement on the context menu. The start point appears. The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set**] key. The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The time interval between the two points appears. The time measurement is shown on the ***Result*** window.

Slope

The followings are distance measurements:

- **Heart – DE Amp Slope, EF Slope**

1. Select the **Heart** folder on the context menu.
2. Select **DE Amp Slope** or **EF Slope**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. When the oblique line appears, the slope is calculated, and the slope measurement is shown on the ***Result*** window.

Fetal Heart Rate

1. Select the **FHR** folder on the context menu.
2. Select **FHR**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Teichholz – IVSd, LVIDd, LVPWd, IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select a Teichholz measurement on the context menu. The start point appears.
   a. Move the start point to the interventricular septum by using the **[Trackball]**.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball]**, the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

M mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-11 M mode calculations (Fetal echo)

Calculation Label	Description	Required
Teichholz		
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs

Define as:

- **Teichholz Method**

  $EDV = 7x(LVIDd^3) / (2.4 + LVIDd)$

  $ESV = 7x(LVIDs^3) / (2.4 + LVIDs)$

  SV= EDV – ESV

  EF= (EDV - ESV) / EDV

  FS= (LVIDd - LVIDs) / LVIDd

D mode measurements (OB1, OB2/3)

D mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 9-12 D mode measurement (OB)

Measurement	Description
Aorta	Aorta
Carotid	Carotid Artery
MCA	Middle Cerebral Artery
Umbilical A	Umbilical Artery
Uterine A	Uterine Artery
SMA	Superior Mesenteric Artery
Celiac A	Celiac Artery
Auto Trace	Auto Trace
Manual Trace	Manual Trace
PS	Peak Systole (PS) Velocity
ED	End Diastole (ED) Velocity
S/D	S/D Ratio
RI	Resistive Index (RI)
PI	Pulsatility Index (PI)
HR	Heart Rate
Ductus Ven	Ductus Venosus
IVC	Inferior Vena Cava
Manual Trace	Manual Trace
S	Ventricular Systole
D	Early Ventricular Diastole
a	Atrial Contraction
S.a.PLI	Preload Index
PI	Pulsatility Index
PVIV	Peak Velocity Index for Veins
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** > **Doppler** > **Default Measurement**.

To select a package measurement,

1 Select a package measurement folder.

2 Select a desired measurement from the measurement list.

In each Doppler package measurement, you can make the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default measurement for each package measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB** >**Doppler** > a package measurement (double-click) > a default measurement.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1 Select **PS**, **ED**, or **MD** on the context menu.
The vertical line and the horizontal line are perpendicular to each other.

2 Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.

3 The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1 Select **S/D** or **D/S** on the context menu. The start point appears.
The vertical line and the horizontal line are perpendicular to each other.

2 Measure the start point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.

3 Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and cpress the **[Set]** key.

4 The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated and the pulsatility index (**PI)** is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. When the end point is fixed, the resistive index is calculated and the resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum value of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated, and the maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and then press the **[Set]** key again.
4. When the oblique line appears, the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

D mode measurements (Fetal Echo)

D mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 9-13 D mode measurement (Fetal echo)

Measurement	Description
Tricuspid Valve	Tricuspid Valve
E-Wave	E-Wave (Early Filling) Velocity
A-Wave	A-Wave (Atrial Contraction) Velocity
Vmax regurg.	Maximum Velocity of Regurgitant Flow
Mitral Valve	Mitral Valve
E-Wave	E-Wave (Early Filling) Velocity
A-Wave	A-Wave (Atrial Contraction) Velocity
Vmax regurg.	Maximum Velocity of Regurgitant Flow
IVRT	Isovolumic Relaxation Time
Main Pulmonary Artery	Main Pulmonary Artery
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Aorta	Aorta
Manual Trace	Manual Trace
Manual Trace AoI	Aortic Isthmus(AoI) Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Vmax AoI	Aortic Isthmus(AoI) Maximal Velocity
Ductus Art.	Ductus Arteriosus
Auto Trace	Auto Trace

Measurement	Description
Manual Trace	Manual Trace
PS	Peak Systole (PS)
RI	Resistive Index (RI)
PS,ED RI,SD	PS,ED RI,SD
ED	End Diastole (ED)
PI	Pulsatility Index (PI)
TPV	Time to Peak Velocity
HR	Heart Rate
Umbilical V	Umbilical Vein
TAmax	Maximum Time-Average Velocity
Ductus Ven.	Ductus Venosus
Manual Trace	Manual Trace
S	Ventricular Systole Velocity
D	Early Ventricular Diastole Velocity
a	Atrial Contraction Velocity
S.a.PLI	Preload Index
PI	Pulsatility Index
PVIV	Peak Velocity Index for Veins
HR	Heart Rate
Pulmonary Valve	Pulmonary Valve
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Acc. Time	Acceleration Time
Eject. Time	Ejection Time
Aortic Valve	Aortic Valve
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Acc. Time	Acceleration Time
PR interval	P-R interval Time
Eject. Time	Ejection Time

Measurement	Description
FHR	Fetal Heart Rate
FHR	Fetal Heart Rate
LVOT	Left Ventricular Outflow Tract
Manual Trace	Manual Trace
Vmax	Maximum Velocity
PR interval	P-R interval Time
ICT	Isovolumic Contraction Time
Eject. Time	Ejection Time
IRT	Isovolumic Relaxation Time
RVOT	Right Ventricular Outflow Tract
Manual Trace	Manual Trace
Vmax	Maximum Velocity
ICT	Isovolumic Contraction Time
Eject. Time	Ejection Time
IRT	Isovolumic Relaxation Time
Pulmonary Vein	Pulmonary Vein
Vd	Diastolic Velocity
Vs	Systolic Velocity
A Rev.V	Atrial Reversal flow velocity
A Rev.Dur	Duration of Atrial Reversal flow velocity
Valves	Valves Package
MV E pt	Mitral Valve E point Velocity
MV A pt	Mitral Valve A point Velocity
AV Vmax	Aortic Valve Peak Velocity
PV Vmax	Pulmonary Valve Peak Velocity
FO	Foramen Ovale Velocity
Ventricles	Ventricles
IVCT	Isovolumetric Contraction Time
LVET	Left Ventricle Ejection Time
IVRT	Isovolumetric Relaxation Time
RVET	Right Ventricle Ejection Time
Arteries	Arteries Package

Measurement	Description
Asc. aorta Vmax	Ascending Aorta Velocity
Thor. aorta Vmax	Thoracic Aorta Velocity
Trans. ao. arch Vmax	Transversal Aortic Arch Velocity
DA Vmax	Ductus Arteriosus Velocity
PA Vmax	Pulmonary Artery Velocity
Umb. A Vmax	Umbilical Artery Velocity
Veins	Veins Package
SVC Vmax	Superior Vena Cava Velocity
IVC Vmax	Inferior Vena Cava Velocity
Lt. PV Vmax	Pulmonary Vein left Velocity
Rt. PV Vmax	Pulmonary Vein right Velocity
Umb. V Vmax	Umbilical Vein Velocity

Velocity

The followings are velocity measurements:

- **Valves – MV E pt, MV A pt, AV Vmax, PV Vmax, FO**
- **Arteries – Asc. aorta Vmax, Thor. aorta Vmax, Trans. ao. arch Vmax, DA Vmax, PA Vmax, Umb. A Vmax**
- **Veins – SVC Vmax, IVC Vmax, Lt. PV Vmax, Rt. PV Vmax, Umb. V Vmax**

1. Select a velocity measurement on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The measured value is fixed, and the velocity is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Ventricles – IVCT, LVET, IVRT, RVET**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears and the time measurement is shown on the ***Result*** window.

D mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-14 D mode calculations

Calculation label	Description	Required measurements
E/A	Mitral Valve E point /A point Ratio	MV E pt MV A pt
TEI-I	TEI Index (Index of Myocardial Performance of Left Ventricle)	IVCT IVRT LVET

Define as:

TEI-I = (IVCT+IVRT)/LVET

OB Report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

Report functions

– See "Patient Worksheets (Reports)" on page 8-29 for more information.

– To select CUA or AUA for gestational age, rotate the **Select AUA/CUA** soft key.

NOTE

To configure the default ultrasound age type, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **OB MEAS.** > **Default US Age Type(Hadlock)** > **AUA** or **CUA**.

– To select the fetus A, B, C, or D, rotate the **Fetus A** soft key. This function is for a multi-gestational patient.

The OB report has three sections of information:

- Patient information
- Measurement information
- Calculation information

Patient information

- **ID**
- **Name**
- **Age**
- **Exam date**
- **Referring MD**
- **LMP** or **IVF**
- **GA(LMP)** or **GA(IVF)**, **EDD(LMP)** or **EDD(IVF)**
- Determined from LMP or IVF data
- **GA(AUA)** or **GA(CUA)**, **EDD(AUA)** or **EDD(CUA)**: If this field is checked, the system uses the measurement to calculate the ultrasound age.
  - AUA: Average Ultrasound age, regression calculation
  - CUA: Composite Ultrasound age, an arithmetric average
- **Fetus**: For a multi-gestational patient, select a fetus (A, B, C, D) in this field.

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–3rd**: The three measurement values for each item are available. If you make more than three measurements, the report uses the last three.
- **GA**: GA is calculated based on the measured values for the fetus. “##” appears when any of the values is out of range.
- **GP**: The growth percentile of each measurement. The GP value is calculated by selecting LMP and AUA.
- **Range**: The typical range of fetal age for this measurement.

  NOTE

  The GA range may not be shown when the range of OB reference (author) is set to none (unavailable).

- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Calculation information

- **EFW**: Show the parameters used to calculate EFW. This is followed by the calculation result.
- **EFW GP**: Show the source used to calculate EFW GP. This is followed by the growth percentile. When you enter LMP, you can check the EFW GP value and reference (Hadlock, Brenner, Williams, Pittaluga).
- **Ratio**: The remaining calculation information shows ratios for several measurements.
- **CI** (Cephalic index): The value calculated by measuring BPD and OFD is displayed.
  - AC/HC
  - FL/BPD
  - FL/HC
  - FL/AC
- **EFW Range**: The GP value is calculated by selecting LMP and AUA.

Fetal Heart Report

To view a report,

1. Select a package measurement folder.
2. Select a desired package measurement.

   NOTE

   If any measurement is performed, it is shown as a check mark (☑) next to the package measurement.

3. When the labeled measurements appear, you can create, edit, or delete values in a cell. You can also change the method item.

The fetal heart report has two sections of information:

- Patient information
- Measurement information

Patient information

The patient information about the fetal heart report is the same as the OB report. See "Patient information" on page 9-40.

Patient information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To set the selected method as default, press the **Save As Default** soft key. To set a method to be used for all measurements in the current measurement preset, press the **Factory Default** soft key.

OB Graph

The OB graph shows curve graphs and bar graphs that indicate predicate fetal growth patterns according to the selected reference (author) for a measurement or calculation.

OB graph allows you to access the fetal growth curve compared to a normal growth curve. When a patient has completed data from the previous studies, you can use the graph to look at fetal trending.

For multi-gestational patients, you can compare the growth on the graphs.

Figure 9-1 OB Graph

Fetal growth – references

Table 9-15 Fetal growth (reference)

Display item name	Description	Reference (Author) name
EFW	Estimated Fetal Weight	Brenner, Doubilet, Hadlock, Hansmann, Hansmann 86, Hobbins/Persutte, JSUM2001, Osaka, Persson Tokyo/Shinozuka, Tokyo, Williams, Yarkoni, Kiserud, EIK-NE2007, Marsal, Pittaluga, Gonzalez, Intergrowth21st
AC	Abdominal Circumference	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Merz, Nicolaides, Shinozuka, Tokyo, Kiserud, Verburg, Intergrowth21st
AFI	Amniotic Fluid Index	Moore
APAD	Anteroposterior Abdominal Diameter	Merz
APTD	Anteroposterior Trunk Diameter	Hansmann

Display item name	Description	Reference (Author) name
AxT	Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter	Shinozuka, Tokyo
BOD	Binocular Distance	Jeanty
BPD	Biparietal Diameter	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Marsal, Merz, Nicolaides, Osaka, Sabbagha, Shinozuka, Tokyo, EIK-NES 2007, Kiserud, Verburg, Intergrowth21st
CLAV	Clavicle Length	Yarkoni
CM	Cisterna Magna	Nicolaides
CRL	Crown-Rump Length	ASUM, Hadlock, Hansmann, JSUM, Marsal, Osaka, Robinson, Shinozuka, Tokyo, Intergrowth21st
FL	Femur Length	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Marsal, Merz, Nicolaides, O'Brien, Osaka, Shinozuka, Tokyo, Warda, EIK-NES 2007, Kiserud, Verburg, Intergrowth21st
FTA	Fetal Trunk Cross-Sectional Area	Osaka
Fibula	Fibula Length	Jeanty
GS	Gestation Sac Length	Hellman, Rempen, Tokyo
HC	Head Circumference	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, Kurmanavicius, Lessoway, Merz, Nicolaides, Kiserud, Verburg, Intergrowth21st
Humerus	Humerus Length	ASUM, Jeanty, Merz, Osaka
SL	Spinal Length	Tokyo
MCA PI	Middle Cerebral Artery Pulsatility Index	Bahlman, JSUM, Schaffer
MCA PS	Middle Cerebral Artery Peak Systole Velocity	Mari
MCA RI	Middle Cerebral Artery Resistive Index	Bahlman, JSUM, Schaffer
MAD	Middle Abdomen Diameter	EIK-NES, Kurmanavicius, EIK-NES 2007, Kiserud
MSD	Mean Gestational Sac Diameter	Hellman, Rempen, Tokyo
OFD	Occipito-frontal Diameter	ASUM, Hansmann, Jeanty, Kurmanavicius, Merz, Nicolaides
Radius	Radius Length	Jeanty, Merz
TAD	Transverse Abdominal Diameter	CFEF, Merz
CEREB	Transverse Cerebellar Diameter	GoldStein, Hill, Nicolaides, Verburg
Tibia	Tibia Length	Jeanty, Merz

Display item name	Description	Reference (Author) name
TTD	Transverse Trunk Diameter	Hansmann
Ulna	Ulna Length	Jeanty, Merz
UmbArt PI	Umbilical Artery Pulsatility Index	JSUM, Merz, Schaffer, Shinozuka, Acharya, Harrington, Rizzo
UmbArt RI	Umbilical Artery Resistive Index	JSUM, Kurmanavicius, Merz, Schaffer, Shinozuka, Acharya
UmbArt SD	Umbilical Artery Systolic Diastolid Ratio	Acharya
AO PI	Aorta Pulsatility Index	Schaffer
AO RI	Aorta Resistive Index	Schaffer
Uterine A PI	Uterine Artery Pulsatility Index	Schaffer, Merz, Bahlmman, O.GOMEZ
Uterine A RI	Uterine Arte Resistive Index	Schaffer, Merz, Kurmanavicius, Bahlmman
Ductus Venosus PI	Ductus Venosus Pulsatility Index	Baschat, Kessler, JSUM2012, Cemil, Fuanglada
Ductus Venosus PLI	Ductus Venosus Preload Index	Baschat, Cemil, Fuanglada
Ductus Venosus PVIV	Ductus Venosus Peak Velocity Index for Veins	Baschat, Cemil, Fuanglada
Ductus Venosus S/a	Ductus Venosus S/a	Baschat, Cemil, Fuanglada, Turan
CI	Cephalic Index	Hadlock
HC/AC	HC and AC ratio Ratio of Head Circumference to Abdominal Circumference	Campbell
FL/BPD	Ratio of Femur Length to Biparietal Diameter	Hohler, Kiserud
FL/AC	Ratio of Femur Length to Abdominal Circumference	Hadlock
FL/HC	Ratio of Femur Length to Head Circumference	Hadlock, Kiserud

Fetal growth curve graphs

To start a curve graph,

– Select **Graph** on the context menu.

– While viewing the OB report, select **Graph** on the context menu.

To view a curve graph,

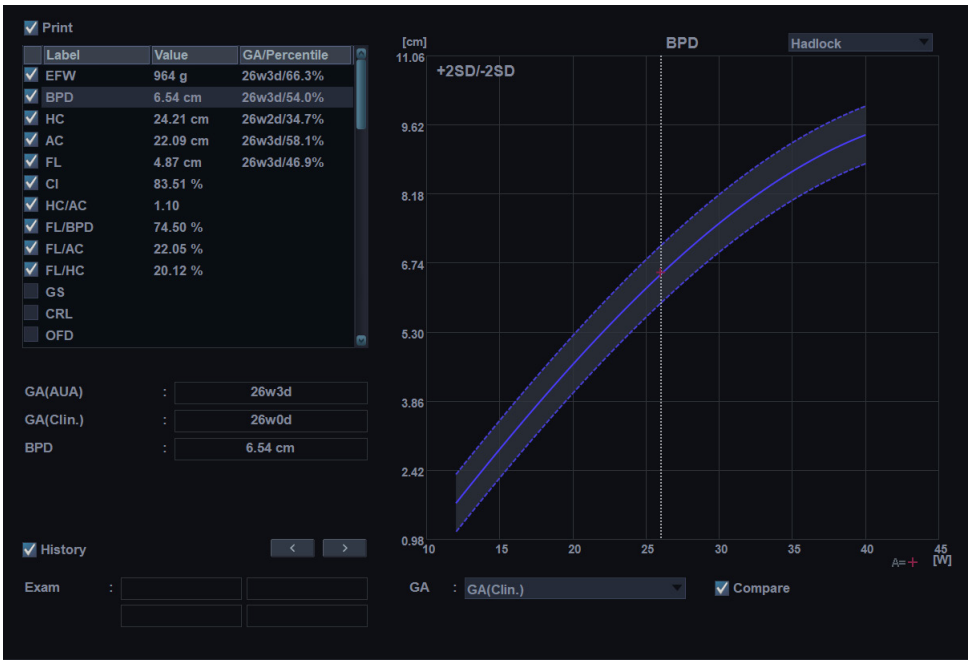


Figure 9-2 Curve Graph

- The horizontal axis shows the fetal age in weeks. This age is determined by the entry data on the ***Patient*** screen. The vertical axis shows one of the followings:
  – For measurements: mm or cm
  – For ratios: percent
  – For fetal weight: gram
- The fetal growth graph shows the following information for the selected measurement:
  – The normal fetal growth curve
  – The standard deviations or relevant percentiles
  – The gestational age of the fetus, using patient data and ultrasound age (vertical dotted line)
  – The current ultrasound measurement data, where the fetus is on the growth curve (symbol)
- On the left of the fetal growth graph, the following additional information appears:
  – **GA(AUA)** or **GA(CUA)**: The system allows you to use the composite ultrasound age (CUA) or average ultrasound age (AUA). Rotate the **Select AUA/CUA** soft key to select a gestational age.
  – **GA(LMP)** or **GA(IVF)**: This data is determined by the LMP (or IVF) data on the ***Patient*** screen.
  – **GA**: This data is calculated based on the measured values for the fetus.

To select a measurement,

1. The system shows a list of fetal growth measurements.
2. The graph list is shown by the order of measurements you performed recently. The check mark ( ) is shown next to the measurement that has measured values.
3. To select a specific measurement, use **[Trackball]** to move to the measurement field and press the **[Set]** key.
4. To scroll through all fetal growth curve graphs, rotate the **Select Graph** soft key.

To change the reference author,

1. Use **[Trackball]** to move the cursor to the reference, and press the **[Set]** key.
2. Select a reference from the drop-down list, and press the **[Set]** key again.

To view fetus trending on graphs,

– Select the **History** check box. The previous and current data are shown on the graph.

To view multiple fetuses data on graphs,

– Select the **Compare** check box. The multiple gestational data is shown on the current graph.

NOTE

The fetus number can be configured in the **Patient** > **OB** > **Exam information** > **Fetus #**.

To view a quad graph,

– Press the **Quad** soft key. The measured values and references are shown at the left of the graph.

To change each graph in the quad view,

1. Use **[Trackball]** to move the cursor to the change graph icon ( ), and press the **[Set]** key.
2. Select a measurement from the measurement list, and press the **[Set]** key. The graph is changed.

Fetal growth bar graphs

To start a bar graph,

– While viewing the OB graph, press the **Bar** soft key.

To view a bar graph,

– The horizontal axis shows the gestational weeks.
– The blue vertical line shows the gestational age (GA) by the LMP data.
– The blue dotted vertical line shows the CUA (or AUA) by the current measured values.
– To select a gestational age, rotate the **Select AUA/CUA** soft key.
– The yellow symbol mark (+) shows the ultrasound GA for each measurement.
– The blue rectangle shows the normal age range for the measurement.

NOTE

You cannot view the fetal trending or multiple fetus data on the bar graph.

Anatomical Survey

The Anatomical Survey page provides a checklist that indicates which anatomy was imaged and its appearance.

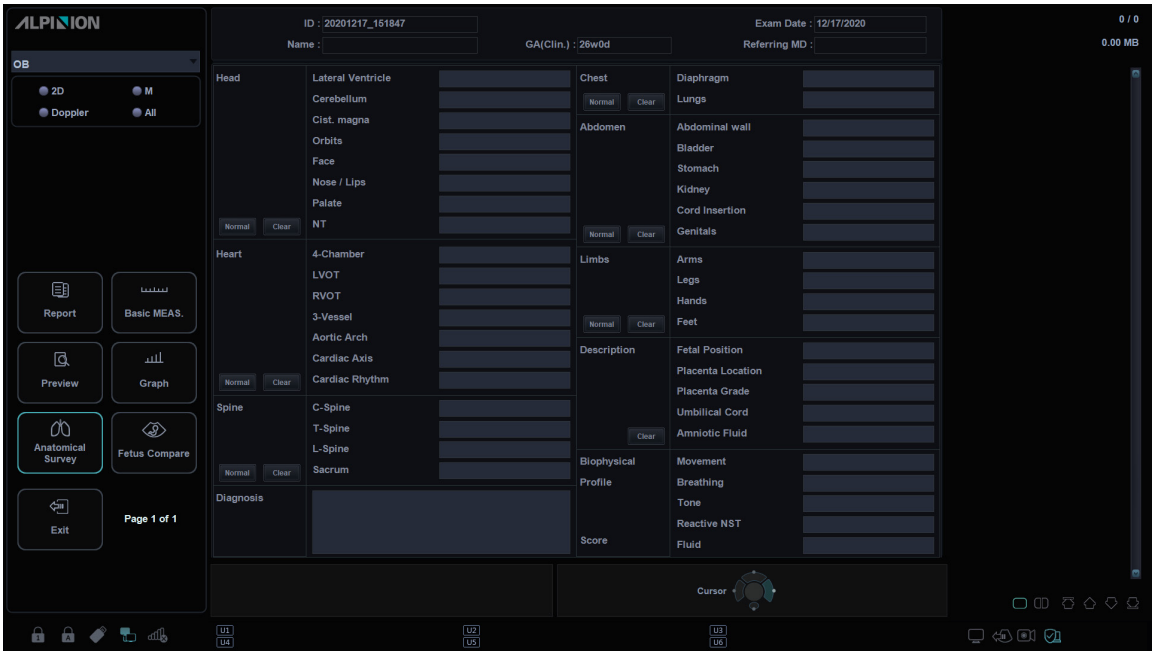


Figure 9-3 Anatomical Survey (OB)

Editing the Anatomical Survey

To edit the anatomical survey,

1. While viewing the OB report, select **Anatomical Survey** on the touch screen to activate the Anatomical Survey.
2. Fill the required field.
   - To set all values in the list as default, select **Default**.
   - To clear all values in the list, select **Clear**.
   - To edit the lists in anatomical survey, use **[Trackball]** to move the cursor to the descriptive data field and press the **[Set]** key. The data field is highlighted, and you can enter the anatomy name.
   - To save the data as default, press the **Save As Default** soft key.
   - To set the anatomical survey list as default, press the **Factory Default** soft key.
   - To clear all input data in the option fields, press the **Clear All** soft key.
3. Select **Exit** to return to the scan screen.
   Select **Report** to return to the Worksheet page.

NOTE

The patient specific contents input on the Anatomical Survey page are returned to the factory default settings after starting a new patient.

Anatomical survey lists

Table 9-16 Anatomical survey (OB)

List	Descriptive data	Options
Head	Lateral Ventricle, Cerebellum Cist. magma, Orbits, Face, Nose / Lips, Palate, NT	(Blank), Normal
Heart	4-Chamber, LVOT, RVOT, 3-Vessel, Aortic Arch, Cardiac Axis, Cardiac Rhythm	(Blank), Normal
Spine	C-Spine, T-Spine, L-Spine, Sacrum	(Blank), Normal
Chest	Diaphragm, Lungs	(Blank), Normal
Abdomen	Abdominal Wall, Stomach, Kidneys, Bladder, Cord Insertion, Genitalia	(Blank), Normal
Limbs	Arms, Legs, Hands, Feet	(Blank), Normal
Description	Fetal Position	Vertex, Breech, Transverse
	Placenta Location	Anterior, Posterior, Fundal, Lateral, Previa
	Placenta Grade	0, 1, 2, 3
	Umbilical Cord	Normal, 2-vessel, Nuchal Cord
	Amniotic Fluid	Normal, Oligohydramnios, Polyhydramnios
Biophysical profile	Fetal Movements	0, 1, 2
	Fetal Breathing	0, 1, 2
	Fetal Tone	0, 1, 2
	Reactive NST (Reactive non-stress test)	0, 1, 2
	Amniotic Fluid	0, 1, 2
	Score	The system totals five data to calculate a score for the biophysical profile.
Diagnosis	Free Text	(Blank)

Multiple Gestation

X-CUBE 70 allows you to measure and report multiple fetus development. The system can report up to four fetuses.

Entering the number of fetuses

If two or more fetuses are imaged during the examination, enter the number of fetuses in the ***Patient*** screen.

When you start an OB exam, the system automatically fills in the ***Fetus #*** field with 1.

To change the number,

1. Touch **Patient** on the touch screen to enter the ***Patient*** screen.
2. Use **[Trackball]** to move the cursor to the ***Fetus #*** field and select the fetus number from the drop-down list. The ***Fetus Number Option*** dialog box appears.
3. To identify each fetus, select **A**, **B**, **C**, or **D** checkbox and then click **OK**.
4. Click **Save & Exit** to save the patient information.

Identifying each fetus

Each fetus is identified by a letter and the total number of fetuses. For example, fetus A/4 is fetus A from a total of 4.

Selecting a fetus

To change between fetuses during measurements and calculations,

– Rotate the **Fetus** soft key.

Viewing multiple fetuses data on graphs

You can view multiple gestation data on fetal growth curve graphs.

To view multiple fetuses data on graphs,

– Select the **Compare** check box.
  The multiple gestational data is shown on the current graph.

Viewing multiple fetuses data on a worksheet

With multiple fetuses, you can list and compare measurements of the fetuses on the worksheet.

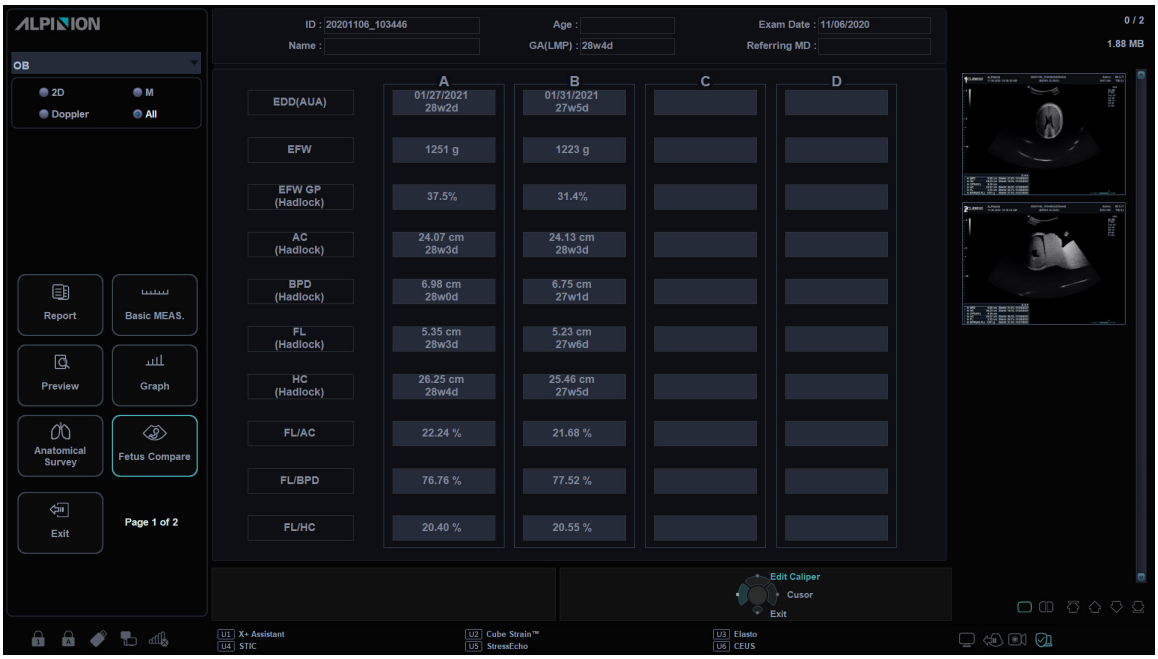


Figure 9-4 Fetus Compare

To compare multiple fetuses data on a worksheet,

– Select **Fetus Compare** on the touch screen.
The measurement results for each fetus are shown on the worksheet.

Gynecology

Gynecology Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the GYN report with measured result, when assigned.

Table 9-17 2D mode measurement (GYN)

Measurement	Description
Endo Thick.	Endometrium Thickness
Cervix L	Cervix Length
Follicle	Follicle Volume
Follicle # 1–30	Measurements of the left and right ovarian follicle
Uterus	Uterus Volume
Uterus L	Uterus Length
Uterus H	Uterus Height
Uterus W	Uterus Width
Ovary	Ovary Volume
Ovary L	Ovary Length
Ovary H	Ovary Height
Ovary W	Ovary Width
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Uterus Vol	Uterus Volume
Ovary Vol	Ovary Volume
Bladder Vol	Bladder Volume
Fibroid	Follicle Volume
Fibroid # 1–15	Measurements of the left and right ovarian follicle
Pelvic Floor	Pelvic Floor
Detrusor wall thick.	Detrusor wall thickness
Urethral rotation	Urethral rotation
Uterine desc.max	Uterine descent max

Measurement	Description
Re.amp.desc.max	Rectal ampulla descent max
Rectocele depth	Bladder neck descent
Bladder neck rest	Bladder neck rest
Bladder neck stress	Bladder neck stress
Bladder desc.max	Bladder descent max
Levator hiat.stress	Levator hiatus stress
Residual urine	Residual urine
Uterine A	Uterine Artery
Uterine A Diam.	Uterine Artery Diameter
Volume Flow Area	Volume Flow Area
Ovarian A	Ovarian Artery
Volume Flow Area	Volume Flow Area

NOTE

To configure the 2D mode measurements, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **GYN** > **2D** > **Default Measurement**.

Endometrium Thickness

1. Select **Endo Thick.** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key.
   The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the endometrium thickness (**Endo Thick.**) is shown on the ***Result*** window.

Follicle Volume

You can make the ovary follicle volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the [**Set]** key. The end point, overlapping the start point, appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

3 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d). When three distances are measured, the volume is calculated.
4. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the follicle volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Follicle** > **Edit**.

Ovary Volume (1)

You can measure the length, width, and height for the left and right ovaries. Each measurement is a typical distance measurement made in appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Ovary** folder, and then select **Ovary L**, **Ovary W**, or **Ovary H**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. After completing the length, width, and height measurement, the ovary volume is calculated.
5. The measured value is fixed, and the ovary volume (**Rt** or **Lt Ovary Vol**) is shown on the ***Result*** window.

Ovary Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Ovary Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
4. The first point is fixed, and the second point appears.
5. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The first distance is measured.
6. Measure the second and third distances in the same manner.
7. When three distances are measured, the volume is calculated.
8. The measured value is fixed, and the ovary volume (**Rt** or **Lt Ovary Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the ovary volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Ovary Vol** > **Edit**.

M mode measurements

M mode measurements display in the context menu and the GYN report with measured result, when assigned.

Table 9-18 M mode measurement (GYN)

Measurement	Description
Ovarian	Ovarian (Package)
Time	Time
Vessel Diam.	Vessel Diameter
%Steno(Dist)	Two Distances Percent Stenosis
HR	Heart Rate
Uterine	Uterine (Package)
Time	Time
Vessel Diam.	Vessel Diameter
%Steno(Dist)	Two Distances Percent Stenosis
HR	Heart Rate
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate

NOTE

To configure the M mode measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **GYN** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the GYN report with measured result, when assigned.

Table 9-19 D mode measurement (GYN)

Measurement	Description
Aorta	Aorta
Umbilical A	Umbilical Artery
Placenta	Placenta
Des. aorta	Descending Aorta
Uterine A	Uterine Artery
Ovarian A	Ovarian Artery
MCA	Middle Cerebral Artery
Vessel	Vessel
FHR	Fetal Heart Rate
HR	Heart Rate

NOTE

To configure the D mode measurement, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **GYN** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

- Heart Rate (HR)

NOTE

To configure the default package measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **GYN** > **Doppler** > **Package measurement** > a default measurement.

Peak Systole, End Diastole, or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu. The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the [Set] key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the [Set] key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points is displayed. The acceleration time (**AT**) is shown on the ***Result*** window.

GYN / Follicle Report

The GYN and Follicle report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Exam date**
- **Referring MD**
- **LMP**
- **Day of Cycle**
- **Gravida**
- **Para**
- **Expected Ovul**
- **Ectopics**
- **Aborta**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Cardiology

Cardiology Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 9-20 2D mode measurement (Cardiology)

Measurement	Description
Ao/LA	Aortic Valve/Left Atrium Package
RV Dm	Right Ventricle Diameter
Ao Dm	Aortic Diameter
LA Dm	Left Atrium Diameter
ACS	Aortic Valve Cusp Separation
LA Vol(Diam)	Left Atrium Package
LA Dm ant-post	Left Atrium Anterior-Posterior Left Atrium Diameter
LA Dm sup-inf	Left Atrium Superior-inferior Left Atrium Diameter
LA Dm med-lat	Left Atrium Mid– lateral Left Atrium Diameter
Aorta Diam	Aorta Package
Ao SV Dm	Aorta – Sinus of Valsalva Diameter
Ao ST Dm	Aorta – Sino-tubular junction Diameter
Ao ASC Dm	Aorta – Ascending Diameter
Ao Arch Dm	Aorta – Arch Diameter
Ao Desc Dm	Aorta – Descending Diameter
Ao Ring Dm	Aorta – Annulus Diameter
Pul.Diam	Pulmonary Artety Package
MPA	Main Pulmonary Artery Diameter
LPA	Left Pulmonary Artery Diameter
RPA	Right Pulmonary Artery Diameter
LUPV	Left Upper Pulmonic Vein
LLPV	Left Lower Pulmonic Vein
RUPV	Right Upper Pulmonic Vein
RLPV	Right Lower Pulmonic Vein
VenaCava	Vena Cave Package

Measurement	Description
IVC Dm	Inferior Vena Cave Diameter
IVC Inspir.	Inferior Vena Cave- Inspiration Diameter
IVC Expir.	Inferior Vena Cave- Expiration Diameter
SVC Dm	Superior Vena Cave Diameter
SVC Inspir.	Superior Vena Cave- Inspiration Diameter
SVC Expir.	Superior Vena Cave- Expiration Diameter
RV	Right Ventricle Package
RVIDd Mid	Mid- Right Ventricle Diameter - End Diastole
RVIDd Base	Base- Right Ventricle Diameter - End Diastole
RVL	Right Ventricle Length - End Diastole
Simpson BP	Left Ventricular Volume by Simpson method (Biplane)
EDV4	Left Ventricle End Diastolic Volume (Apical four chamber)
ESV4	Left Ventricle End Systolic Volume (Apical four chamber)
EDV2	Left Ventricle End Diastolic Volume (Apical two chamber)
ESV2	Left Ventricle End Systolic Volume (Apical two chamber)
HR	Heart Rate
Simpson SP	Left Ventricular Volume by Simpson method (Single plane)
EDV4	Left Ventricle End Diastolic Volume (Apical four chamber)
ESV4	Left Ventricle End Systolic Volume (Apical four chamber)
EDV2	Left Ventricle End Diastolic Volume (Apical two chamber)
ESV2	Left Ventricle End Systolic Volume (Apical two chamber)
HR	Heart Rate
Modified Simpson	Modified Simpson method
LVLd Apical	Left ventricular long-axis length at end diastole
LVAd sax MV	Left ventricular short-axis area at the level of the mitral valve at end diastole
LVAd sax PM	Left ventricular short-axis area at the level of the papillary muscle at end diastole
LVLs Apical	Left ventricular long-axis length at end systole
LVAs sax MV	Left ventricular short-axis area at the level of the mitral valve at end systole
LVAs sax PM	Left ventricular short-axis area at the level of the papillary muscle at end systole
HR	Heart Rate
Area Length	Left Ventricular Volume by Area-Length method
LVAd 4	Left Ventricle End Diastolic Area (Apical four chamber)

Measurement	Description
LVAs 4	Left Ventricle End Systolic Area (Apical four chamber)
LVAd 2	Left Ventricle End Diastolic Area (Apical two chamber)
LVAs 2	Left Ventricle End Systolic Area (Apical two chamber)
HR	Heart Rate
Teichholz	Left Ventricular Dimensions by Teichholz method
RVAWd	Right Ventricle Anterior Wall - End Diastole
RVDd	Right Ventricle Diameter - End Diastole
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole
HR	Heart Rate
LV Mass T-E	Left Ventricle Mass by Truncated Ellipse
LVA Epi	Left Ventricle End Diastolic Epicardial Area at the Papillary Muscle level
LVA Endo	Left Ventricle End Diastolic Endocardial Area at the Papillary Muscle level
a	Left Ventricle Semi-major Axis Diastolic Dimension
d	Left Ventricle Truncated Semi-major Axis Diastolic Dimension
LV Mass A-L	Left Ventricle Mass by Area-Length method
LVAd Epi	Left Ventricle End Diastolic Epicardial Area at the Papillary Muscle level
LVAd Endo	Left Ventricle End Diastolic Endocardial Area at the Papillary Muscle level
LVLd	Left Ventricle Length- End Diastole
LVAs Epi	Left Ventricle End Systolic Epicardial Area at the Papillary Muscle level
LVAs Endo	Left Ventricle End Systolic Endocardial Area at the Papillary Muscle level
LVLs	Left Ventricle Length- End Systole
LA Vol(A-L)	Left Atrium Volume by Area-Length method
LA A4C	Left Atrium End Systolic Area-Length (Apical four chamber)
LA A2C	Left Atrium End Systolic Area-Length (Apical two chamber)
LA Vol(Simp)	Left Atrium Volume by Simpson method (Biplane)
ESV4	Left Atrium End Systolic Volume (Apical four chamber)
ESV2	Left Atrium End Systolic Volume (Apical two chamber)

Measurement	Description
RA Vol(A-L)	Right Ventricular Volume by Area-Length method
RA A4C	Right Ventricular End Systolic Area-Length (Apical four chamber)
RA Vol(Simp)	Right Ventricular Volume by Simpson method (Single Plane)
RA Vol(Simp)	Right Ventricular End Systolic Volume (Apical four chamber)
TV	Tricuspid Valve Package
TR VC Dm	Vena Contracta Diameter
PISA	Proximal Isovelocity Surface Area
AR Radius	Aortic Regurgitation Radius
AR Aliasing Vel.	Aortic Regurgitation Aliasing Velocity
MR Radius	Mitral Regurgitation Radius
MR Aliasing Vel.	Mitral Regurgitation Aliasing Velocity
TR Radius	Tricuspid Regurgitation Radius
TR Aliasing Vel.	Tricuspid Regurgitation Aliasing Velocity
PR Radius	Pulmonary Regurgitation Radius
PR Aliasing Vel.	Pulmonary Regurgitation Aliasing Velocity
MV	Mitral Valve Package
EPSS	Point Septal Separation
MV Dm	Mitral Valve Diameter
LVOT Dm	Left Ventricular Outflow Track Diameter
MV Area	Mitral Valve Area
MR VC Dm	Vena Contracta Diameter
MR Jet Area	Mitral Regurgitant Jet Area
AV	Aortic Valve Package
AV Area	Aortic Valve Area
LVOT Dm	Left Ventricular Outflow Track Diameter
AR VC Dm	Vena Contracta Diameter
AR Jet Area	Aortic Regurgitant Flow jet
PV	Pulmonary Valve Package
PV Dm	Pulmonary Valve Diameter
Subvalvaular Dm	Subvalvaular Diameter
Supravalvular Dm	Supravalvualr Diameter
RVOT Dm	Right Ventricular Outflow Track Diameter

Measurement	Description
Qp/Qs	
LVOT Dm	Left Ventricular Outflow Track Diameter
RVOT Dm	Right Ventricular Outflow Track Diameter
Auto EF	Auto ejection fraction
Auto EF (A4C)	Automatic Ejection Fraction (Apical four chamber)
Auto EF (A2C)	Automatic Ejection Fraction (Apical two chamber)

NOTE

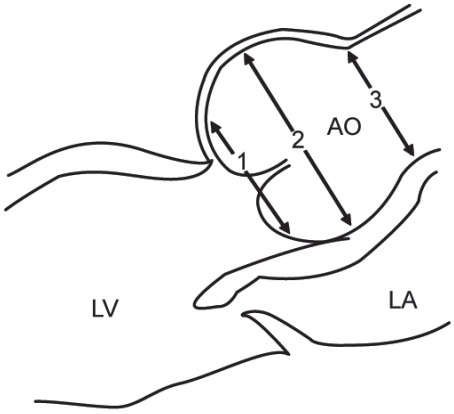
To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Cardiology** > **2D** > **Default Measurement**.

Aortic Root Diameter

To measure the aortic root diameters,

- **Ao ST Dm**
- **Ao SV Dm**
- **Ao Ring Dm**

1. Select the **Aorta Diam** folder on the context menu.
2. Select **Ao ST Dm**, **AO SV Dm**, or **Ao Ring Dm**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the diameter measurement is shown on the ***Result*** window.



① Aortic Annulus – Ring Diameter

② Aortic Sinuses of Valsalva Diameter

③ Aortic Tubular Junction Diameter

Valve Area (Trace)

To measure the valve area,

- **MV Area**
- **AV Area**

1. Select the **MV** or **AV** folder on the context menu.
2. Select **MV Area** or **AV Area**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point. A line shows the traced area.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the valve area measurement is shown on the ***Result*** window.

Right Atrium – Single Plane Simpson's Method

This method allows you to calculate the volume of the right atrium on the four chamber cross-sectional image. **RA Vol(Simp)** indicates the Simpson measurement.

1. During a Cardiology study, freeze a 4 chamber cross-sectional image.
2. Press the **[Measure]** key on the control panel.
3. Select the **RA Vol(Simp)** folder on the context menu.
4. Select **RA Vol(Simp)**. The start point appears.
5. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
6. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key.
7. When the start and end points are connected and a line representing the long axis is shown, press the **[Set]** key again.
8. The measured value is fixed, and the measured value is shown on the ***Result*** window.

Right Ventricle Diameter

The followings are right ventricle measurements:

- **RVIDd Mid**
- **RVIDd Base**
- **RVL**

1. Select the **RV** folder on the context menu.
2. Select **RVIDd Mid**, **RVIDd Base**, or **RVL**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the Right Ventricle diameter measurement is shown on the ***Result*** window.

Left Atrium – Biplane Area Length Method

This method allows you to calculate the volume of the left atrium on the two chamber and four chamber cross-sectional images. The followings are area length measurements:

- **LA A4C**
- **LA A2C**

1. During a Cardiology study, freeze 4 chamber or 2 chamber cross-sectional images.
2. Use **[Trackball]** to scroll through cine images.
3. From the frame image of the end diastole, press the **[Measure]** key on the control panel.
4. Select the **LA Vol(A-L)** folder on the context menu.
5. Select **LA A4C** or **LA A2C**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key. The measured value is fixed.
6. The measured value is fixed, and the measured value is shown on the ***Result*** window.

NOTE

When the length is measured in both the 4 chamber and 2 chamber cross-sectional views, the shortest value is used in the Area Length formula.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Diastole – IVSd, LVIDd, LVPWd**
- **Systole – IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select **Diastole** or **Systole**. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball],** the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

Left Ventricle – Biplane Simpson's Method

This method allows you to calculate the volume of the left ventricle on two chamber and four chamber cross-sectional images. The followings are Simpson BP measurements:

- **EDV2**
- **ESV2**
- **EDV4**
- **ESV4**

1. During a Cardiology study, freeze a 4 chamber or 2 chamber cross-sectional images.
2. Use **[Trackball]** to scroll through cine images.
3. From the frame image of the end diastole, press the **[Measure]** key on the control panel.
4. Select the **Simpson BP** folder on the context menu.
5. Select **EDV4** or **EDV2**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key.
   c. When the start and end points are connected and a line representing the long axis is shown, press the **[Set]** key again. The volume is calculated.
6. Press the **[Exit]** key.
7. Use **[Trackball]** to scroll through cine images.
8. From the End systole frame image, press the **[Measure]** key on the control panel.
9. Select the **Simpson BP** folder on the context menu.
10. Select **ESV4** or **ESV2**.
11. Perform the measurement of the disk volume in the same manner (a-c).
12. When the volume trace is completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

Regurgitation Flow – Jet Area

1. While performing a Cardiology study in Color Flow mode, press the **[Freeze]** key to freeze an image.
2. Press the **[Measure]** key on the control panel.
3. Select the **AV** or **MV** folder on the context menu.
4. Select **AR Jet Area** or **MR Jet Area**. The start point appears.
5. Use **[Trackball]** to move the marker to the start point.
6. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
7. Use **[Trackball]** to move the marker to the end point. A line shows the traced regurgitant jet area.
8. To complete the measurement, press the **[Set]** key.
9. The measured value is fixed, and the regurgitant jet area is shown on the ***Result*** window.

Regurgitation Flow – Vena Contracta Diameter

The followings are Vena Contracta measurements:

- **AR VC Dm**
- **MR VC Dm**

1. While performing a Cardiology study in Color Flow mode, press the **[Freeze]** key to freeze an image.
2. Use **[Trackball]** to scroll to the largest diameter of the vena contracta.
3. Press the **[Measure]** key on the control panel.
4. Select the **AV** or **MV** folder on the context menu.
5. Select **AR VC Dm** or **MR VC Dm**. The start point appears.
6. Use **[Trackball]** to move the marker to the start point.
7. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
8. Use **[Trackball]** to move the marker to the end point.
9. To complete the measurement, press the **[Set]** key.
10. The measured value is fixed, and the vena contracta diameter is shown on the ***Result*** window.

2D mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-21 2D mode calculations (Cardiology)

Calculation Label	Description	Required
Ao/LA	Aortic Valve/Left Atrium Package	
Ao/LA	Aortic Valve / Left Ventricle Ratio	Ao Dm, LA Dm
LA/Ao	Left Artrium / Aortic Valve Ratio	Ao Dm, LA Dm
LA Vol(Diam)	Left Atrium Package	
LA Vol		LA Dm apt-post, LA Dm sup-inf, LA Dm med-lat
LA Vol. index		LA Vol, BSA
Area Length,	Area Length method,	
Simpson Method	Simpson's method of Disk volume	
EDV	End Diastolic Volume	LVLd, LVAd
ESV	End Systolic Volume	LVLs, LVAs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
Teichholz	Teichholz method	
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
LV(s) Mass	Left Ventricular Mass	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass-c	Left Ventricular Mass Corrected	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass index	Left Ventricular Mass Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA

Calculation Label	Description	Required
LV(s) Mass-c index	Left Ventricular Mass Corrected Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
LV Mass T-E	Left Ventricle Mass by Truncated Ellipse	
LV Mass(T-E)	Left ventricular mass using a Truncated Ellipse	LVA Epi, LVA Endo, a, d
LV Mass index	Left Ventricular Mass Index	LV Mass(T-E), BSA
LV Mass A-L	Left Ventricle Mass by Area-Length method	
LV(d,s) Mass(A-L)	Left ventricular mass using a Area-Length method	LVA(d,s) Epi, LVA(d,s) Endo, LVL(d,s)
LV(d,s) Mass index	Left Ventricular Mass Index	LV(d,s) Mass(A-L) BSA
RA Vol(Simp)	Right Ventricular Volume by Simpson method (Single Plane)	
RA Vol(Simp)	Right Ventricular Volume Index	RA Vol(Simp), BSA
PISA	Proximal Isovelocity Surface Area	
Flow Rate	Peak Instantaneous Flow Rate	Radius, Aliasing Vel
ERO	Effective Regurgitant Orifice	Radius, Aliasing Vel, Vmax
Auto EF	Automatic Ejection Fraction	
Auto EF (Biplane)	Automatic Ejection Fraction (Biplane method)	

Define as:

- **Area Length Method**

  EDV =(8/(3π))xLVAd² / LVLd

  ESV =(8/(3π))xLVAs² / LVLs

- **Simpson's Method**

$$EDV = \frac{\pi}{4} \times \sum_{i=1}^{n=20} (a_i \times b_i) \times \frac{LVLD}{20}$$

$$ESV = \frac{\pi}{4} \times \sum_{i=1}^{n=20} (a_i \times b_i) \times \frac{LVLD}{20}$$

  a_i : Radius of the i-th ellipse (2CH)

  b_i : Radius of the i-th ellipse (4CH)

- **Teichholz Method**

  $EDV = 7x(LVIDd^3) / (2.4 + LVIDd)$

  $ESV = 7x(LVIDs^3) / (2.4 + LVIDs)$

  SV= EDV – ESV

  CO= SVxHR

  EF= (EDV - ESV) / EDV

  FS= (LVIDd - LVIDs) / LVIDd

  SI= SV / BSA

  CI= CO / BSA

  NOTE

  BSA is automatically calculated when you enter the height and weight of a patient from the ***Patient*** screen.

  $LV\ Mass = 1.04x\{(IVSd + LVIDd + LVPWd)^3 - (LVIDd)^3\}$

  LV Mass-c= 0.8xLV Mass+0.6

  LV Mass Index= LV Mass / BSA

- **PISA**

  $Flow\ Rate = 2\pi x Radius^2 x Aliasing\ Vel$

  NOTE

  When you select **Aliasing Vel(edit)** on the context menu, you can edit the velocity value by entering it on the color bar.

AO/LA Ratio

1. Select the **Ao/LA** folder on the context menu.
2. Select **Ao Dm**. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. The aortic valve diameter is fixed.
4. Select **LA Dm**.
5. Perform the measurement of the left atrium diameter in the same manner (a-d).
6. When two diameter measurements are completed, the measured value is fixed, and the ratio is shown on the Report or Mini Report page.

Left Ventricular Mass – Area Length Method

The followings are LV Mass measurements:

- **LVAd Epi, LVAs Epi**
- **LVAd Endo, LVAs Endo**
- **LVLd, LVLs**

1. Select **LV Mass A-L** folder on the context menu.
2. Select the **LVAd Epi** or **LVAs Epi**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the epicardial area with the second point and press the **[Set]** key. The measured value is fixed.
3. Select **LVAd Endo** or **LVAs Endo**.
4. Perform the measurement of the endocardial area in the same manner (a-b).
5. Select **LVLd** or **LVLs**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
6. When two area measurements and one diameter are completed, the measured value is fixed, and the LV mass is shown on the Report or Mini Report page.

Auto EF measurements

Auto EF (Automated Ejection Fraction) is a semi-automatic measurement tool used for measurement of the global EF (Ejection fraction).

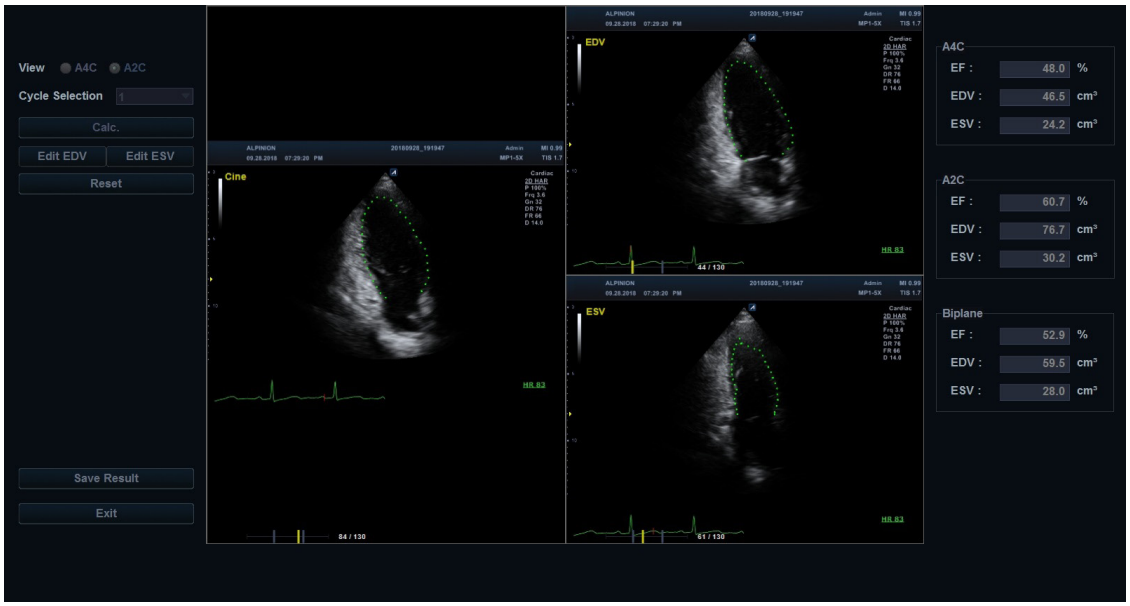


Figure 9-5 Auto EF Display

To perform an Auto EF measurement,

1. Connect the ECG device and activate the ECG function to acquire a stable ECG trace.
2. Acquire 2D cine images of an Apical 4 chamber view and an Apical 2 chamber view by pressing the **[Freeze]** key.
3. After acquiring the cine images, press the **[Measure]** key and select **Auto EF** on the touch screen. The ***Auto EF*** screen appears.
4. Select the name of current cadiac view (**A4C**, **A2C**) on the touch screen.
   An endocardial border will automatically be traced.
5. If necessary, select the ECG cycle from the ***ECG Cycle*** drop-down list, and select **Calc.** to start the calculation.
   When the processing is completed, the Ejection fraction is automatically calculated again.
6. If necessary, select **Edit EDV** or **Edit ESV** to edit the endocardial border trace.
   You may adjust the trace by moving the cursor over the endocardial border trace, select an anchor point and drag it to a new location. The shape of the endocardial border trace is updated accordingly.
7. When the editing is completed, select **Calc.** to start the calculation.
8. The resulting Ejection Fraction (**EF**) , the End Diastolic volume (**EDV**) and the End Systolic Volume (**ESV**) are displayed in a table on the right.

   NOTE

   The Biplane results will only appear on screen after measuring both A2C and A4C views.
9. To save the result, select **Save Result** on the touch screen. The results are shown on the worksheet.
10. To exit Auto EF, select **Exit** on the touch screen.

Auto IVC measurements

Auto IVC (Automated inferior vena cava) is a semi-automatic measurement tool used for measurement of the inferior vena cava (IVC).

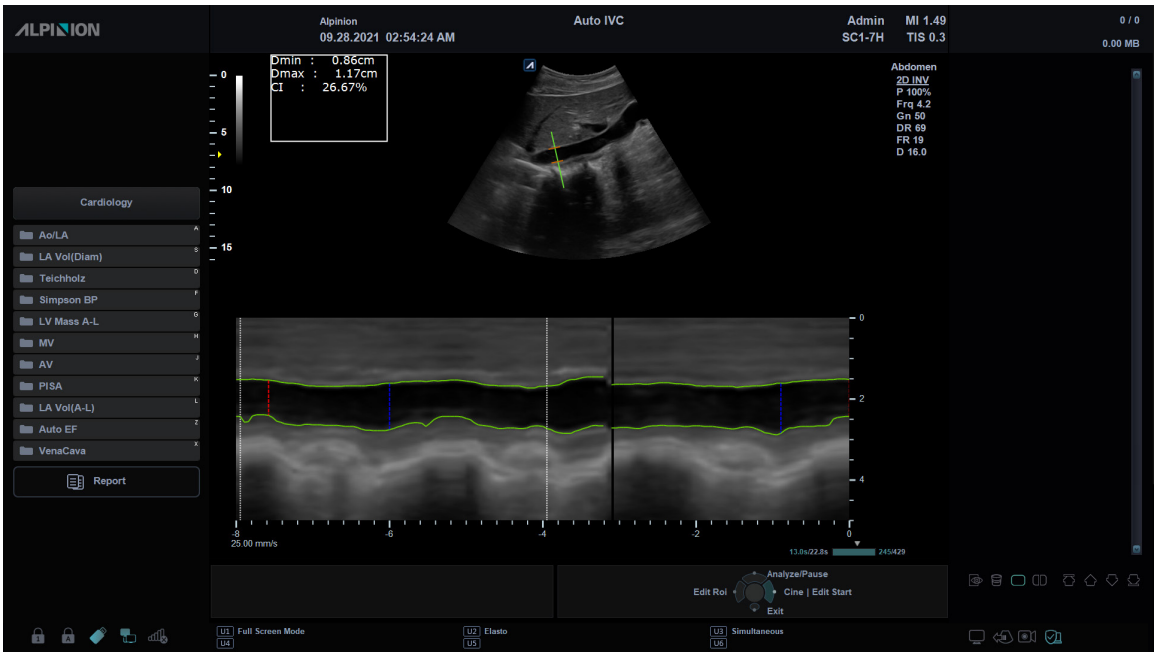


Figure 9-5 Auto IVC Display

To measure the Inferior Vena Cava (IVC) automatically,

1. Scan the patient in the subcostal position to view the IVC on the 2D-mode screen.
2. Acquire a IVC view by pressing the **[Freeze]** key on the control panel.
3. Select **AutoIVC** on the touch screen. The Auto IVC screen appears.
   - The system displays 2D mode along with the M-mode timeline.
   - The cursor line appears over the IVC.
   - The cross-section of the IVC is traced along the M-mode timeline.
   - CTI markers appear as red /blue vertical lines at 4.0 sec. intervals.
4. If the patient is ventilated, select **Mechanical** by rotating the **Type** soft key.
   The measurement is switched from CI to DI.
   - **Spontenuous**: For patients with spontaneous breathing.
   - **Mechanical**: For patients with mechanical ventilation.
5. View the cursor line appearing and stabilizing automatically on the IVC. If the cursor line has not been positioned correctly, select **EditROI** and move the cursor line to the desired position by using **[Trackball]**.
6. If necessary, adjust the angle of the cursor line by rotating the **[Angle]** key on the control panel.
7. If necessary, adjust the sweep speed and cycles by using each soft key.
8. Select **Analyze/Pause** to start measuring the IVC.

9 The system highlights the selected CTI on the M-mode timeline and display the maximum diameter measured frame in the 2D-mode screen. The results of the measurements appear in the result box, on the left upper side of the screen.

10 To save the result, select **Add Report** on the touch screen. The results are shown on the ***Report*** screen.

11 To exit Auto IVC, select **Exit** on the touch screen.

M mode measurements

M mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 9-22 M mode measurement (Cardiology)

Measurement	Description
Teichholz	Left Ventricular Dimensions by Teichholz method
RVAWd	Right Ventricle Anterior Wall -End Diastole
RVDd	Right Ventricle Diameter - End Diastole
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole
LVET	Left Ventricular Ejection Time
MAPSE	Mitral Annular Plane Systolic Excursion
HR	Heart Rate
Ao/LA	Aortic Valve/Left Atrium Package
RV Dm	Right Ventricular Diameter
LA Dm	Left Atrial Diameter
Ao Dm	Aortic Diameter
ACS	Aortic Cusp Separation
LVET	Left Ventricle Ejection Time
LVPEP	Left Ventricle Pre-Ejection Period
MV	Mitral Valve Package
EPSS	E Point Septal Separation
DE slope	Mitral Valve D-E point Slope
DE Exc	Mitral Valve D-E Excursion
EF slope	Mitral Valve E-F point Slope
AC Imterval	Mitral Valve A-C Interval
CE Exc	Mitral Valve E wave excursion
CA Exc	Mitral Valve A wave excursion
RV	Right Ventricle Package

Measurement	Description
RV Dm	Right Ventricular Diameter – End Diastole
RVOT Dm	Right Ventricular Outflow Track Diameter
RVET	Right Ventricular Ejection Time
RVPEP	Right Ventricular Pre-ejection Period
TAPSE	Tricuspid Annular Plane Systolic Excursion
Pul.Vein	Pulmonary Vein Package
Pul.Vein Dm	Pulmonary Vein Diameter

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Cardiology** > **M** > **Default Measurement**.

Diameter

The followings are distance measurements:

- **Ao/LA – RV Dm, LA Dm, Ao Dm, ACS**
- **MV – CE Exc, CA Exc, EPSS**
- **RV – RV Dm, RVOT Dm, TAPSE**

1. Select a distance measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance measurement is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Ao/LA, Teichholz, RV – LVET, RVET**
- **Ao/LA, RV – LVPEP, RVPEP**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and then press the **[Set]** key again.
4. The time interval between the two points appears and the time measurement is shown on the ***Result*** window.

Slope

The followings are distance measurements:

- **MV – DE Exc, DE slope, EF slope**

1. Select the **MV** folder on the context menu.
2. Select **DE Exc, DE slope** or **EF slope**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The oblique line is displayed and the slope is calculated. The slope measurement is shown on the ***Result*** window.

Heart Rate (HR)

1. Select the **Teichholz** folder on the context menu.
2. Select **HR**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Diastole – IVSd, LVIDd, LVPWd**
- **Systole – IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select **Diastole** or **Systole**. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball],** the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. When three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 lengths measurement with a straight line. When you select **IVS**, **LVID**, or **LVPW**, you can perform the 1 distance measurement.

M mode calculation

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-23 M mode calculations (Cardiology)

Calculation Label	Description	Required
Ao/LA	Aortic Valve/Left Atrium Package	
Ao/LA	Aortic Valve/ Left Ventricle Ratio	Ao Dm, LA Dm
LA/Ao	Left Ventricle/ Aortic Valve Ratio	Ao Dm, LA Dm
LVSTI	Left Ventricular Systolic Time Intervals	LVPEP, LVET
MV	Mitral Valve Package	
CA Exc/CE Exc	A wave excursion / E wave excursion Ratio	CA Exc, CE Exc
RV	Right Ventricle Package	
RVSTI	Right Ventricular Systolic Time Intervals	RVPEP, RVET
Teichholz	Teichholz Method	
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
LV(s) Mass	Left Ventricular Mass	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass-c	Left Ventricular Mass Corrected	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass index	Left Ventricular Mass Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
LV(s) Mass-c index	Left Ventricular Mass Corrected Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
mVcf	Mean Velocity of Circumferential Fiber Shortening	LVIDd, LVIDs, LVET
RWT	Relative Wall Thickness	LVPWd, LVIDd

Define as:

LVSTI= LVPEP/LVET

Teichholz Method

EDV= $7x(LVIDd^3) / (2.4 + LVIDd)$

ESV= $7x(LVIDs^3) / (2.4 + LVIDs)$

SV= EDV – ESV

CO= SV x HR

EF= (EDV - ESV) / EDV

FS= (LVIDd - LVIDs) / LVIDd

SI= SV / BSA

CI= CO / BSA

NOTE

BSA is automatically calculated when you enter the height and weight of a patient from the ***Patient*** screen.

LV Mass= $1.04x\{(IVSd + LVIDd + LVPWd)^3 - (LVIDd)^3\}$

LV Mass-c= 0.8xLV Mass+0.6

LV Mass index= LV Mass / BSA

mVcf= (LVIDd-LVIDs)/(LVIDdxLVET)

D mode measurements

D mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 9-24 D mode measurement (Cardiology)

Measurement	Description
TV	Tricuspid Valve Package
TV VTI	Tricuspid Valve Velocity Time Integral
TV Vmax	Tricuspid Valve Peak Velocity
TV E Vel.	Tricuspid Valve E point Velocity
TV A Vel.	Tricuspid Valve A point Velocity
RVET	Right Ventricular Ejection Time
TCO	Tricuspid Valve Close-Open Duration Time
TV Dec. Time	Tricuspid Valve Deceleration Time
TR dP/dt	Tricuspid Regurgitation Rate of change of pressure over time
TR VTI	Tricuspid Regurgitation Velocity Time Integral
TR Vmax	Tricuspid Regurgitation Peak Velocity
RAP(edit)	Right Atrium Pressure Selection (edit)
Pul.Vein	Pulmonary Vein Package
P Vein S	Pulmonary Vein Systolic Peak Velocity
P Vein D	Pulmonary Vein Diastolic Peak Velocity
P Vein A	Pulmonary Vein Atrial Contraction Reversal Peak Velocity
Pul. A Dur.	Pulmonary Vein a wave Duration Time
TDI	Left Ventricle Tissue Doppler Imaging
MV E Vel.	Mitral Valve E point Velocity
Sep E'	Septal TDI E point Velocity
Sep A'	Septal TDI A point Velocity
Sep S'	Septal TDI S point Velocity
Sep AR/DR	Mitral Lateral Annulus E wave Acceleration & Deceleration Time and Slope
Lat E'	Lateral TDI E point Velocity
Lat A'	Lateral TDI A point Velocity
Lat S'	Lateral TDI S point Velocity
Lat AR/DR	Mitral Medial Annulus E wave Acceleration & Deceleration Time and Slope
RV E'	Right Ventricle TDI E point Velocity

Measurement	Description
RV A'	Right Ventricle TDI A point Velocity
RV S'	Right Ventricle TDI S point Velocity
TV E	Tricuspid Valve E point Velocity
TV E'	Tricuspid Valve TDI E point Velocity
Sep E' VTI	Septal TDI E point Velocity Time Integral
Sep A' VTI	Septal TDI A point Velocity Time Integral
Lat E' VTI	Lateral TDI E point Velocity Time Integral
Lat A' VTI	Lateral TDI A point Velocity Time Integral
Sep E'(T)	Septal TDI E point (Time)
Sep S'(T)	Septal TDI S point (Time)
Lat E'(T)	Lateral TDI E point (Time)
Lat S'(T)	Lateral TDI S point (Time)
Sep IVRT	Septal Isovolumetric Relaxation Time
Sep IVCT	Septal Isovolumetric Contraction Time
Lat IVRT	Lateral Isovolumetric Relaxation Time
Lat IVCT	Lateral Isovolumetric Contraction Time
AV	Aortic Valve Package
AV VTI	Aortic Valve Velocity Time Integral
LVOT VTI	Left Ventricular outflow Track Velocity Time Integral
AV Vmax	Aortic Valve Maximum Velocity
LVOT Vmax	Left Ventricular outflow Track Maximum Velocity
IVCT	Isovolumetric Contraction Time
IVRT	Isovolumetric Relaxation Time
LVET	Left Ventricular Ejection Time
MCO	Mitral Valve Close-Open Duration Time
HR	Heart Rate
AR PHT	Aortic Regurgitant Flow Pressure Half Time
AR VTI	Aortic Regurgitant Flow Velocity Time Integral
AR Decel Slope	Aortic Regurgitant Flow Deceleration Time and Slope
PV	Pulmonary Valve Package
PV VTI	Pulmonary Valve Track Velocity Time Integral
PV Vmax	Pulmonary Valve Peak Velocity

Measurement	Description
PV Acc Time	Pulmonary Valve Acceleration Time and Slope
RVOT VTI	Right Ventricular outflow Track Velocity Time Integral
RVOT Vmax	Right Ventricular outflow Track Maximum Velocity
RVET	Right Ventricular Ejection Time
HR	Heart Rate
PR VTI	Pulmonary Regurgitation Velocity Time Integral
PR Vmax	Pulmonary Regurgitation Peak Velocity
PR EDV	Pulmonary Regurgitation End Diastole Velocity
Qp/Qs	Shunts
LVOT VTI	Left Ventricular Outflow Track Velocity Time Integral
Systemic HR	Systemic Heart Rate
RVOT VTI	Right Ventricular Outflow Track Velocity Time Integral
Pulmonic HR	Pulmonic Heart Rate
PISA	Proximal Isovelocity Surface Area
AR VTI	Aortic Regurgitant Flow Velocity Time Integral
AR Aliasing Vel.	Aortic Regurgitation Aliasing Velocity
MR VTI	Mitral Regurgitant Flow Velocity Time Integral
MR Aliasing Vel.	Mitral Regurgitation Aliasing Velocity
TR VTI	Tricuspid Regurgitant Flow Velocity Time Integral
TR Aliasing Vel.	Tricuspid Regurgitation Aliasing Velocity
PR VTI	Pulmonary Regurgitant Flow Velocity Time Integral
PR Aliasing Vel.	Pulmonary Regurgitation Aliasing Velocity
MV	Mitral Valve Package
E Dur	Mitral Valve E wave Duration Time
A Dur	Mitral Valve A wave Duration Time
MV E/A Vel.	Mitral Valve E point/A point Ratio
MV E Vel.	Mitral Valve E point Velocity
MV Dec Time	Mitral Valve Deceleration Time
MV A Vel.	Mitral Valve A point Velocity
MVA(PHT)	Mitral Valve Area (Pressure Half Time)
MV VTI	Mitral Valve Velocity Time Integral
LVOT VTI	Left Ventricular outflow Track Velocity Time Integral

Measurement	Description
IVCT	Isovolumetric Contraction Time
IVRT	Isovolumetric Relaxation Time
LVET	Left Ventricular Ejection Time
MCO	Mitral Valve Close-Open Duration Time
Sep E'	Septal TDI E point Velocity
Sep A'	Septal TDI A point Velocity
Sep S'	Septal TDI S point Velocity
HR	Heart Rate
MR Vmax	Mitral Regurgitation Peak Velocity
MR dP/dt	Mitral Regurgitation Rate of change of pressure over time

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Cardiology** > **Doppler** > **Default Measurement**.

Velocity

The followings are velocity measurements:

- **MV – MV E Vel., MV A Vel., Sep E', Sep A', Sep S', MR Vmax**
- **AV – AV Vmax, LVOT Vmax**
- **TV – TV Vmax, TV E Vel., TV A Vel., TR Vmax**
- **PV – PV Vmax, RVOT Vmax, PR Vmax, PR EDV**
- **Pul.Vein – P Vein S, P Vein D, P Vein A**
- **TDI – MV E Vel., Sep E', Sep A', Sep S', Lat E', Lat A', Lat S', RV E', RV A', RV S', TV E, TV E'**

1. Select a velocity measurement on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity is shown on the ***Result*** window.

Time

The followings are time measurements:

- **MV – E Dur, A Dur, IVCT, IVRT, LVET, MCO**
- **AV – IVCT, IVRT, LVET, MCO**
- **TV – RVET, TCO**
- **Pul.Vein – Pul. A Dur.**
- **TDI –Sep E'(T), Sep S'(T), Lat E'(T), Lat S'(T)**
- **PV – RVET**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set**] key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears, and the time measurement is shown on the ***Result*** window.

VTI

The followings are velocity-time integral measurements:

- **TV – TV VTI, TR VTI**
- **AV – AV VTI, AR VTI**
- **PV – PV VTI, RVOT VTI, PR VTI**
- **PISA – AR VTI, MR VTI, TR VTI, PR VTI**
- **MV – MV VTI, LVOT VTI**
- **TDI – Sep E' VTI, Sep A' VTI, Lat E' VTI, Lat A' VTI**

1. Select a velocity-time integral measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the waveform one cycle.
4. To complete the measurement, press the **[Set]** key.
5. The velocity-time integral is calculated, and the velocity-time integral is shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

D mode calculation

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-25 D mode calculations (Cardiology)

Calculation Label	Description
MV	Mitral Valve
E/A	Mitral Valve E point /A point Ratio
MV Vmean	Mitral Valve Mean Velocity
MV PGmax	Mitral Valve Maximum Pressure Gradient
MV PGmean	Mitral Valve Mean Pressure Gradient
MVA(VTI)	Mitral Valve Area-Velocity Time Integral
LV MPI	Left Ventricle Index of Myocardial Performance
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
MV E/E'(S)	Mitral Valve E point/Mitral Annulus Ea point Ratio
MR PGmax	Mitral Regurgitation Maximum Pressure Gradient
MR dP/dt	Mitral Regurgitation dP/dt derived from velocity
AV	Aortic Valve
AV Vmean	Aortic Valve Mean Velocity
AV PGmax	Aortic Valve Maximum Pressure Gradient
AV PGmean	Aortic Valve Mean Pressure Gradient
LVOT Vmean	Left Ventricular outflow Track Mean Velocity
LVOT PGmax	Left Ventricular outflow Track Maximum Pressure Gradient

Calculation Label	Description
LVOT PGmean	Left Ventricular outflow Track Mean Pressure Gradient
AVA(VTI)	Aortic Valve Area-Velocity Time Integral
AVA(Vmax)	Aortic Valve Area- Maximum Velocity
AVA index(VTI)	Aortic Valve Area index by Velocity Time Integral
AVA index(Vmax)	Aortic Valve Area index by Maximum Velocity
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
Qp/Qs	Pulmonary Valve Cardiac Output / Aortic Valve Cardiac Output Ratio
Qp-Qs	Pulmonary Valve Cardiac Output - Aortic Valve Cardiac Output
LV MPI	Left Ventricle Index of Myocardial Performance
TV	Tricuspid Valve
TV Vmean	Tricuspid Valve Mean Velocity
TV PGmax	Tricuspid Valve Maximum Pressure Gradient
TV PGmean	Tricuspid Valve Mean Pressure Gradient
E/A	Tricuspid Valve E point /A point Ratio
RV MPI	Tricuspid Valve-Right Ventricle Index of Myocardial Performance
TR Vmean	Tricuspid Valve Regurgitation Flow - Mean Velocity
TR PGmax	Tricuspid Valve Regurgitation Flow - Maximum Pressure Gradient
TR PGmean	Tricuspid Valve Regurgitation Flow - Mean Pressure Gradient
RVSP	Right Ventricular Systolic Pressure
PV	Pulmonary Valve
PV Vmean	Pulmonary Valve Mean Velocity
PV PGmax	Pulmonary Valve Maximum Pressure Gradient
PV PGmean	Pulmonary Valve Mean Pressure Gradient
RVOT Vmean	Right Ventricular outflow Track Mean Velocity
RVOT PGmax	Right Ventricular outflow Track Maximum Pressure Gradient
RVOT PGmean	Right Ventricular outflow Track Mean Pressure Gradient
PVA(VTI)	Pulmonary Valve Area-Velocity Time Integral
PVA(Vmax)	Pulmonary Valve Area-Maximum Velocity
PVA index(VTI)	Pulmonic Valve Area index by Velocity Time Integral

Calculation Label	Description
PVA index(Vmax)	Pulmonic Valve Area index by Maximum Velocity
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
Qp/Qs	Pulmonary Valve Cardiac Output/ Aortic Valve Cardiac Output Ratio
Qp-Qs	Pulmonary Valve Cardiac Output - Aortic Valve Cardiac Output
PISA	Proximal Isovelocity Surface Area
RV	Regurgitation Volume Flow
TDI	Tissue Doppler Imaging
E'/A'(S)	Left Ventricular Early Diastolic Velocity / Atrial Systolic Velocity Ratio
MV E/E'(S)	Mitral Valve E point/Mitral Annulus Ea point Ratio
E'/A'(L)	Left Ventricular Early Diastolic Velocity / Atrial Systolic Velocity Ratio
MV E/E'(L)	Mitral Valve E point/Mitral Annulus Ea point Ratio
TV E/RV E'	Tricuspid Valve E point / Right Ventricle TDI E point Ratio
TV E/E'(R)	Tricuspid Valve E point / Right Ventricle TDI E point Ratio

Define as:

PGmax= $4V^2$

MVA(PHT)= 220/MV PHT

MVA(VTI)= πx(LVOT Dm/2/10)^{2}xLVOT VTI / MV VTI

AVA(VTI)= πx(LVOT Dm/2/10)^{2}xLVOT VTI / AV VTI

LV MPI= (MV C-Odur – LVET) / LVET

RV MPI= (TV C-Odur – RVET) / RVET

RVSP= TR $Vmax^2$x4 + RAP

dP/dt=32 / dtx1000

EO Area=2 πx$Radius^2$xAliasing Vel / Vmax (Regurgitation flow)

Flow Vol= EO AreaxVTI (Regurgitation flow)

- **Mitral Valve**

  SV= πxMV Dm^2 / 4xMV VTI

- **Aortic Valve**

  SV= πxLVOT Dm^2 / 4xLVOT VTI

- **Pulmonary Valve**

  SV= πxPV Dm^2 / 4xPV VTI

  CO= SVxHR

  SI= SV / BSA

  CI= CO / BSA

- **Pressure Gradient – PGmax, PGmean**

  The maximum pressure gradient is calculated from a maximum velocity using a velocity measurement method or from the tracing waveform.

  The mean pressure gradient is calculated from the mean velocity using the trace measurement method.

Valve Area by Pressure Half Time (PHT)

- **MV – MVA(PHT)**
- **AV – AR PHT**

1. Select the **MV** or **AV** folder on the context menu.
2. Select **MVA(PHT)** or **AR PHT**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move the point to the e-wave velocity of the mitral valve, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point to the half point of the PHT, and press the **[Set]** key again.
5. The measured value is calculated, and the mitral valve area is shown on the ***Result*** window.

Valve Area by the Continuity Equation (VTI)

You can measure the mitral valve area and aortic valve area by using the velocity-time integral (VTI) of the Continuity Equation.

1. During a Cardiology study in 2D mode, press the **[Freeze]** key to freeze an image.
2. Use **[Trackball]** to scroll to the largest LVOT diameter.
3. Press the **[Measure]** key on the control panel.
4. Select the **MV**, **AV**, or **PV** folder on the context menu.
5. Select **LVOT Dm** or **RVOT Dm**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The measured value is fixed.
6. During a Cardiology study in D mode, freeze the Doppler spectrum.
7. Press the **[Measure]** key on the control panel.
8. Select the **MV, AV**, or **PV** folder on the context menu.
9. Select **LVOT VTI** or **RVOT VTI**. The start point appears.
   a. The vertical line and the horizontal line are perpendicular to each other.
   b. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key. The end point appears.
   c. Use **[Trackball]** to trace one cycle of the waveform.
   d. To complete the measurement, press the **[Set]** key. The measured value is fixed.
10. Perform the measurement of the second VTI (**MV VTI, AV VTI,** or **PV VTI**) in the same manner (a-c).
11. After one diameter and two VTI are completed, the measured value is calculated and the mitral or aortic valve area is shown on the ***Result*** window, Report page, and Mini Report page.

dP/dt

1. Select the **MV** folder on the context menu.
2. Select **MR dP/dt**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. The horizontal line indicating regurgitation velocities of 1m/s and 3m/s.
4. Move the marker to the start point using **[Trackball]** where the MR jet intersects the reference line at a velocity of 1m/s, and then press the **[Set]** key.
   The end point appears.
5. Use **[Trackball]** to move the marker to the start point where the MR jet intersects the reference line at a velocity of 3m/s, and then press the **[Set]** key.
6. The measured value is fixed, and the value for dP/dt is shown on the ***Result*** window, Report page, and Mini Report page.

Cardiology Report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

The cardiology report has two sections of information:

- Patient information
- Measurement information

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**
- **BSA**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the measurement value type, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

WMS Report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **WMS Report** on the context menu.

NOTE

You can view the WMS report after performing and saving the Stress echo function.

To view more studies, use the combo box or the **Exam** soft key.

To view another stage, select **Next Stage**.

Vascular

Vascular Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 9-26 2D mode measurement (Vascular)

Measurement	Description
Carotid	Carotid Artery
CCA	Common Carotid Artery
ICA	Internal Carotid Artery
ECA	External Carotid Artery
Vert. A	Vertebral Artery
Bulb	Carotid Bulb
UEA	Upper Extremity Artery
Subclav. A	Subclavian A
Axill. A	Axillary Artery
Basilar A	Basilar Artery
Brach. A	Brachial Artery
DBA	Deep Brachial Artery
Basilic A	Basilic Artery
Radial A	Radial Artery
Ulnar A	Ulnar Artery
SPA	Superficial Palmar Arch
Innom. A	Innominate Artery
UEV	Upper Extremity Vein
IJV	Internal Jugular Vein
Subclav. V	Subclavian Vein
Ceph. V	Cephalic Vein
Axill. V	Axillary Vein
Brach. V	Brachial Vein
DBV	Deep Brachial Vein
Basilic V	Basilic Vein

Measurement	Description
Radial V	Radial Vein
Ulnar V	Ulnar Vein
Innom. V	Innominate Vein
LEA	Lower Extremities Arteries
CIA	Common Iliac Artery
EIA	External Iliac Artery
IIA	Internal Iliac Artery
CFA	Common Femoral Artery
DFA	Deep Femoral Artery
SFA	Superficial Femoral Artery
Pop. A	Popliteal Artery
PTA	Posterior Tibial Artery
ATA	Anterior Tibial Artery
Peron. A	Peroneal Artery
DPA	Dorsalis Pedis Artery
Prof. A	Profunda Femoris Artery
LEV	Lower Extremities Veins
CIV	Common Iliac Vein
EIV	External Iliac Vein
IIV	Internal iliac vein
CFV	Common Femoral Vein
DFV	Deep Femoral Vein
SFV	Superficial Femoral Vein
GSV	Great Saphenous Vein
LSV	Lesser Saphenous Vein
Pop. V	Popliteal Vein
PTV	Posterior Tibial Vein
ATV	Anterior Tibial Vein
Peron. V	Peroneal Vein
Prof. V	Profunda Femoris Vein
TCD	Transcranial Doppler
MCA	Middle Cerebral Artery

Measurement	Description
ACA	Anterior Cerebral Artery
PCA P1	Posterior Celebral Artery P1 segment
PCA P2	Posterior Celebral Artery P2 segment
Vert. A	Vertebral Artery
Basilar A	Basilar Artery
ICA	Internal Carotid Artery
PComA	Posterior Communicating Artery
AComA	Anterior Communicating Artery
Renal	Renal
Renal A	Renal Artery
Renal V	Renal Vein
Segm. A	Segmental Artery
Interlob. A	Interlobar Artery of Kidney
Arcuate A	Arcuate Artery of the Kidney
Aorta Iliac	Aorta Iliac
Renal A	Renal Artery
CFA	Common Femoral Artery
Mesenteric	Mesenteric
Abd. Aorta	Aorta
Celiac A	Celiac Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
Hepatic A	Common Hepatic Artery
Portal V	Portal Vein
Splenic A	Splenic Artery
Bypass Graft	Bypass Graft
Straight Gft	Straight Graft
Loop Gft	Loop Graft
Cimino Gft	Cimino Graft
Comp Gft	Composite Graft

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Vascular** > **2D** > **Default Measurement**.

To select a package measurement,

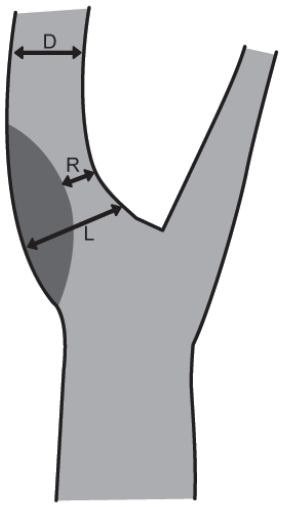
1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurement, you can use the following measurements:

- Diameter (Diam)
- Area
- %Stenosis-Diameter (%Steno(Diam) and %Steno(Diam) dist)
- %Stenosis-Area (%Steno(Area))
- Pre-Stent Diameter (Pre-Stent Diam.)
- In-Stent Diameter (In-Stent Diam.)
- Post-Stent Diameter (Post-Stent Diam.)
- IMT/Auto IMT
- Volume Flow Area

%Stenosis (Diameter)

1. Select **%Steno(Diam)** or **%Steno(Diam) dist** on the context menu. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters percent stenosis (**%Steno Diam** or **%Steno dist**) are automatically shown on the ***Result*** window.



ESCT method= (L-R)/Lx100 %, N/ASCET method= (D-R)/Dx100 %

- %Steno(Diam): Stenosis Local Gradient Diameter (%), ESCT (European Carotid Surgery Trial) method
- %Steno(Diam) dist: Stenosis Distal Gradient Diameter (%), NASCET (North American Symptomatic Carotid Surgery Trial) method

%Stenosis (Area)

1. Select **%Steno(Area)** on the context menu. The start point appears.
2. Measure the outer area (**A1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the inner area (**A2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters percent stenosis (**%Steno Area**) are automatically shown on the ***Result*** window.

Intima-Media Thickness (IMT) measurements

IMT

To measure the IMT manually,

1. Acquire a longitudinal view of the carotid artery by pressing the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **IMT** on the context menu. The start point appears.
4. Use **[Trackball]** to move the marker to the start point.
5. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
6. Use **[Trackball]** to move the marker to the end point.
7. To complete the measurement, press the **[Set]** key.
8. The measured value is fixed, and the intima-media thickness (**IMT(D)**) is shown on the ***Result*** window.

Auto IMT

To measure the IMT automatically,

1. Acquire a longitudinal view of the carotid artery by pressing the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **Auto IMT** on the touch screen. The start point appears.
4. From the point of the arterial branch about 5 mm away, draw a straight line of 10 mm by using **[Trackball]**. The end point appears.
5. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
6. The system calculates the measured value and shows the Mean, Max, Distance, and QI on the ***Result*** window.

NOTE

The Auto IMT values are shown with an apostrophe mark (') on the worksheet.

To measure the IMT manually,

– Select **Manual** by rotating the **Caliper** soft key, and make one distance measurement.

NOTE

After the automatic measurement is completed, you can make one distance measurement manually, if necessary, to cross check the result.

M mode measurements

M mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 9-27 M mode measurement (Vascular)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Vascular** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 9-28 D mode measurement (Vascular)

Measurement	Description
Carotid	Carotid Artery
CCA	Common Carotid Artery
ICA	Internal Carotid Artery
ECA	External Carotid Artery
Vert. A	Vertebral Artery
Bulb	Carotid Bulb
UEA	Upper Extremity Artery
Subclav. A	Subclavian A
Axill. A	Axillary Artery
Basilar A	Basilar Artery
Brach. A	Brachial Artery
DBA	Deep Brachial Artery
Basilic A	Basilic Artery
Radial A	Radial Artery
Ulnar A	Ulnar Artery
SPA	Superficial Palmar Arch
Innom. A	Innominate Artery
UEV	Upper Extremity Vein
IJV	Internal Jugular Vein
Subclav. V	Subclavian Vein
Ceph. V	Cephalic Vein
Axill. V	Axillary Vein
Brach. V	Brachial Vein
DBV	Deep Brachial Vein
Basilic V	Basilic Vein
Radial V	Radial Vein
Ulnar V	Ulnar Vein
Innom. V	Innominate Vein

Measurement	Description
LEA	Lower Extremities Arteries
CIA	Common Iliac Artery
EIA	External Iliac Artery
IIA	Internal Iliac Artery
CFA	Common Femoral Artery
DFA	Deep Femoral Artery
SFA	Superficial Femoral Artery
Pop. A	Popliteal Artery
PTA	Posterior Tibial Artery
ATA	Anterior Tibial Artery
Peron. A	Peroneal Artery
DPA	Dorsalis Pedis Artery
Prof. A	Profunda Femoris Artery
LEV	Lower Extremities Veins
CIV	Common Iliac Vein
EIV	External Iliac Vein
IIV	Internal iliac vein
CFV	Common Femoral Vein
DFV	Deep Femoral Vein
SFV	Superficial Femoral Vein
GSV	Great Saphenous Vein
LSV	Lesser Saphenous Vein
Pop. V	Popliteal Vein
PTV	Posterior Tibial Vein
ATV	Anterior Tibial Vein
Peron. V	Peroneal Vein
Prof. V	Profunda Femoris Vein
TCD	Transcranial Doppler
MCA	Middle Cerebral Artery
ACA	Anterior Cerebral Artery
PCA P1	Posterior Celebral Artery P1 segment
PCA P2	Posterior Celebral Artery P2 segment

Measurement	Description
Vert. A	Vertebral Artery
Basilar A	Basilar Artery
ICA	Internal Carotid Artery
PComA	Posterior Communicating Artery
AComA	Anterior Communicating Artery
Renal	Renal
Renal A	Renal Artery
Renal V	Renal Vein
Segm. A	Segmental Artery
Interlob. A	Interlobar Artery of Kidney
Arcuate A	Arcuate Artery of the Kidney
Aorta Iliac	Aorta Iliac
Renal A	Renal Artery
CFA	Common Femoral Artery
Mesenteric	Mesenteric
Abd. Aorta	Aorta
Celiac A	Celiac Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
Hepatic A	Common Hepatic Artery
Portal V	Portal Vein
Splenic A	Splenic Artery
Bypass Graft	Bypass Graft
Straight Gft	Straight Graft
Loop Gft	Loop Graft
Cimino Gft	Cimino Graft
Comp Gft	Composite Graft

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Vascular** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement, you can use the following measurements:

- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D Ratio (S/D)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Velocity Time Integral (VTI)
- Maximum Velocity (Vmax Pre, Vmax Intra)
- Stent Maximum Velocity (Vmax Pre-Stent, Vmax In-Stent, Vmax Post-Stent)
- Stent Minimum Velocity (Ved Pre-Stent, Ved In-Stent, Ved Post-Stent)

Velocity

1. Select a labeled measurement for velocity on the context menu. The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity is shown on the ***Result*** window.

PS/ED Ratio

1. Select **S/D** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S, D**) and S/D ratio (**S/D**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

D mode calculations

The calculation labels may not be available shown in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-29 D mode calculations (Vascular)

Calculation	Description	Required
PVR	Peak Velocity Ratio	Vmax Pre-Stent Vmax In-Stent
%Steno PVR	Stenosis using the peak velocity ratio	Vmax Pre-Stent Vmax In-Stent
S/D	Peak Systole Velocity/End diastole Velocity Ratio	PS, ED

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Vascular** > **Doppler** > **Default Measurement**.

Define as:

PVR = Vmax (Stenosis intra) / Vmax (Stenosis pre)

%Steno PVR = 1-(1/PVR)

Vascular Report

The vascular report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

Vascular Summary

To start a summary,

– Select **Summary** on the context menu.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

On the Summary page, the result values are shown on the each side (left, right), if the measurement includes the both side values.

NOTE

You cannot edit the result values on the Summary page.

Calculation information

The calculation information is shown on the bottom of the Summary page. The following information is available: ICA PS/CCA PS, ICA ED/CCA ED, Bulb PS/CCA PS, Bulb ED/CCA ED

Urology

Urology Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 9-30 2D mode measurement (Urology)

Measurement	Description
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Testicle	Testicle Volume
Testicle L	Testicle Length
Testicle H	Testicle Height
Testicle W	Testicle Width
Prostate	Prostate Volume
Prostate L	Prostate Length
Prostate H	Prostate Height
Prostate W	Prostate Width
Residual	Residual Volume
Pre L	Pre Bladder Length
Pre H	Pre Bladder Height
Pre W	Pre Bladder Width
Post L	Post Bladder Length
Post H	Post Bladder Height
Post W	Post Bladder Width
Pre Vol	Pre Bladder Volume

Measurement	Description
Post Vol	Post Bladder Volume
Void Vol	Void Volume (Difference between Pre and Post Volume)
Renal Vol	Renal Volume
Bladder Vol	Bladder Volume
Testicle Vol	Testicle Volume
Prostate Vol	Prostate Volume

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **2D** > **Default Measurement**.

Renal Volume (1)

You can measure the length, width, and height for the left and right renal. Each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select the **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurement are completed, the renal volume is calculated.
5. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the renal volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **Renal Vol** > **Edit**.

Bladder Volume (1)

You can measure the length, width, and height of the bladder. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Bladder** folder on the context menu.
2. Select **Bladder L**, **Bladder H**, or **Bladder W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the bladder volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

Bladder Volume (2)

1. Select **Bladder Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the bladder volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **Bladder Vol** > **Edit**.

2D mode calculations

NOTE

The calculation labels are not shown in the measurement menu.

The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 9-31 2D mode calculations (Urology)

Calculation label	Description	Required measurements
PSAD	Prostatic Specific Antigen Density	PSA Prostate Volume
PPSA(1)	Predicted Prostate Specific Antigen	PPSA Coefficient (1) Prostate Volume
PPSA(2)	Predicted Prostate Specific Antigen	PPSA Coefficient (2) Prostate Volume

Define as:

PSAD = PSA / Prostate Vol

PPSA = Prostate Vol × PPSA Coefficient

NOTE

If you enter the value of PSA and PPSA Coefficient on the ***Patient*** screen, PSAD and PPSA are automatically calculated.

Prostate Volume (1)

You can measure the length, width, and height of the prostate. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Prostate** folder on the context menu.
2. Select **Prostate L**, **Prostate H**, or **Prostate W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the prostate volume is calculated.
5. The measured value is fixed. The prostate volume (**Prostate Vol)** and calculations (**PSAD** and **PPSA**) are shown on the ***Result*** window.

Prostate Volume (2)

1. Select **Prostate Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the prostate volume (**Prostate Vol)** is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the prostate volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **Prostate Vol** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 9-32 M mode measurement (Urology)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 10-33 D mode measurement (Urology)

Measurement	Description
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Urology** > **Doppler** > **Default Measurement**.

Urology Report

The urology report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**
- **PSA**
- **PPSA Coef(1)**
- **PPSA Coef(2)**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Pediatrics

Pediatrics Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 9-34 2D mode measurement (Pediatrics)

Measurement	Description
Aorta	Aorta Diameter
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Renal Vol	Renal Volume
Hip	Hip Angle
Hip(BA)	The system calculates and shows angles β and α.
Hip(AB)	The system calculates and shows angles α and β.
Hip(Rotate)	Hip Angle (Type to measure by rotating the **[Angle]** key)
d:D	The ratio of acetabular depth to diameter of the femoral head (d/D)

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Pediatrics** > **2D** > **Default Measurement**.

Renal Volume (1)

You can measure the length, width, and height of the left and right renal. Each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the renal volume is calculated.
5. The measured value is fixed. The renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

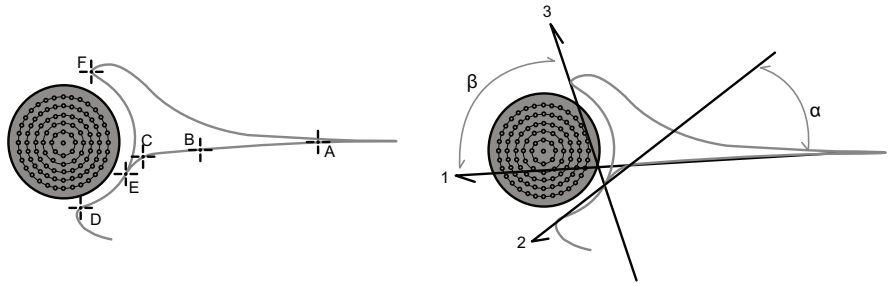
NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the renal volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Renal Vol** > **Edit**.

Hip Joint (BA)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the beta angle (β). The third line establishes the alpha angle (α).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **Hip(BA)**.
   The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The baseline is completed.
5. Perform the measurement for the second (β) and third (α) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.



- To define the baseline, point **a** and **b**.
- To define the α angle line, point **c** and **d**.
- To define the β angle line, point **e** and **f**.

Hip Joint (AB)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the alpha angle (α). The third line establishes the beta angle (β).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **Hip(AB)**.
   The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The baseline is completed.
5. Perform the measurement for the second (α) and third (β) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

Hip(Rotate)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **Hip(Rotate)**.
   The first distance measurement (baseline) is already selected.
3. Rotate the **[Angle]** Key to adjust the angle of the baseline, and press the **[Set]** Key.
4. Rotate the **[Angle]** Key to adjust the alpha angle (α), and press **[Set]** Key.
5. Press the **[Angle]** Key to adjust the beta angle (β), press **[Set]** Key.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

d:D Ratio

To measure the percentage of the femoral head coverage under the bony roof,

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **d:D**.
3. Press the **[Set]** Key. A circle appears.
4. Use **[Trackball]** to move the center of the circle and press the **[Set]** key to fix the circle.
5. Use **[Trackball]** to draw a line across the circle, and press the **[Set]** key.
6. The ratio of the long distance and the short distance is calculated.
7. The measured value is fixed ,and the d:D ratio (**d:D**) is shown on the ***Result*** window.

M mode measurements

M mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 9-35 M mode measurement (Pediatrics)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Pediatrics** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 9-36 D mode measurement (Pediatrics)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
CHA	Hepatic Artery
IVC	Inferior Vena Cava
Hepatic V	Hepatic Vein
Mid HV	Middle Hepatic Vein
MPV	Main Portal Vein
Portal V	Portal Vein
Splenic A	Splenic Artery
Splenic V	Splenic Vein
SMA	Superior Mesenteric Artery
SMV	Superior Mesenteric Vein
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Iliac V	Iliac Vein
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default package measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Doppler** > **Package measurement** > desired default measurements.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
2. The vertical line and the horizontal line are perpendicular to each other.
3. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
5. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. To trace the maximum value of the desired portion for the spectrum, use **[Trackball]**.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

Pediatrics Report

The pediatrics report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max** or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Small Parts

Small Parts Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 9-37 2D mode measurement (Small parts)

Measurement	Description
Thyroid Vol	Thyroid Volume
Testicle Vol	Testicle Volume
Thyroid	Thyroid Volume
Thyroid L	Thyroid Length
Thyroid H	Thyroid Height
Thyroid W	Thyroid Width
Testicle	Testicle Volume
Testicle L	Testicle Length
Testicle H	Testicle Height
Testicle W	Testicle Width
Isthmus	Testicle Volume
Isthmus H	Isthmus Height
Nodule	Nodule Volume
Nodule # 1–10	Measurements of the left and right Thyroid Nodule
Lymph Node	Lymph Node Volume
Lymph Node # 1–10	Measurements of the Lymph Node
Parathyroid	Parathyroid Volume
Parathyroid # 1–4	Measurements of the left and right Parathyroid
Epididymis	Epididymis Volume
Epididymis L	Epididymis Length
Epididymis H	Epididymis Height
Epididymis W	Epididymis Width
Epididymis Cyst(s)	Epididymis Cyst(s) Volume
Epididymis Cyst(s) L	Epididymis Cyst(s) Length
Epididymis Cyst(s) H	Epididymis Cyst(s) Height

Epididymis Cyst(s) W	Epididymis Cyst(s) Width
Testicular Cyst(s)	Testicular Cyst(s) Volume
Testicular Cyst(s) L	Testicular Cyst(s) Length
Testicular Cyst(s) H	Testicular Cyst(s) Height
Testicular Cyst(s) W	Testicular Cyst(s) Width
Testicular Nodule(s)	Testicular Nodule(s) Volume
Testicular Nodule(s) L	Testicular Nodule(s) Length
Testicular Nodule(s) H	Testicular Nodule(s) Height
Testicular Nodule(s) W	Testicular Nodule(s) Width

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Small Parts** > **2D** > **Default Measurement**.

Thyroid Volume (1)

You can measure the length, width, and height for the left and right thyroid. The each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Thyroid** folder, and then select **Thyroid L**, **Thyroid H**, or **Thyroid W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the thyroid volume is calculated.
5. The measured value is fixed, and the thyroid volume (**Rt** or **Lt Thyroid Vol**) is shown on the ***Result*** window.

Thyroid Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Thyroid Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the thyroid volume (**Rt** or **Lt Thyroid Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the thyroid volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Small Parts** > **Thyroid Vol** > **Edit**.

Testicle Volume (1)

You can measure the length, width, and height of the scrotum. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Testicle** folder, and then select **Testicle L**, **Testicle H**, or **Testicle W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the testicle volume is calculated.
5. The measured value is fixed, and the testicle volume (**Rt** or **Lt Testicle Vol**) is shown on the ***Result*** window.

Testicle Volume (2)

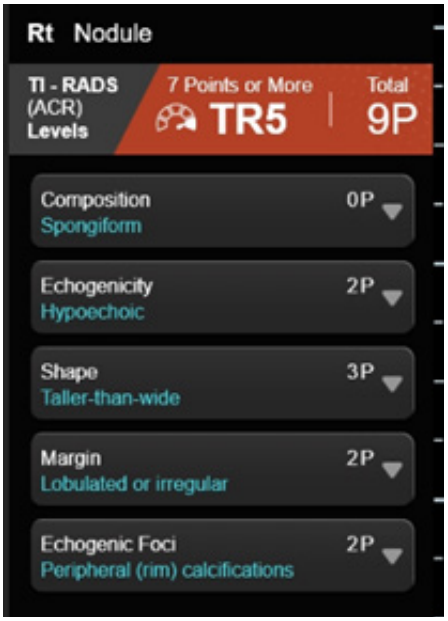
1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Testicle Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the testicle volume (**Rt** or **Lt Testicle Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the testicle volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Small Parts** > **Testicle Vol** > **Edit**.

TI-RADS Assessment

1. Register the Patient ID.
2. Press the **[Measure]** key on the control panel.
3. Select the **TI-RADS** on the soft menu.
4. Evaluation list of the TI-RADS appears on the context menu.



5. After assessment of each item, enter the **Report** page.

NOTE

TI-RADS is not supported while using the Full Screen mode or X+ Assistant.

M mode measurements

M mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 9-38 M mode measurement (Small parts)

Measurement	Description
Distance	Distance
Time	Time
Slope	Slope
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Small Parts** > **M** > **Default Measurement**.

Distance

1. Select **Distance** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

Time

1. Select **Time** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 9-39 D mode measurement (Small parts)

Measurement	Description
Thyroid Flow	Thyroid Flow
Testicle Flow	Testicle Flow
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Small Parts** > **Doppler** > **Default Measurement**.

Small Parts Report

The small parts report has three sections of information:

- Patient information
- Measurement information
- Thyroid analysis

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Thyroid Analysis

To start the thyroid analysis,

– While viewing the thyroid report, select **Analysis** on the context menu.

NOTE

The patient specific contents input on the Analysis page are returned to the factory default settings after starting a new patient.

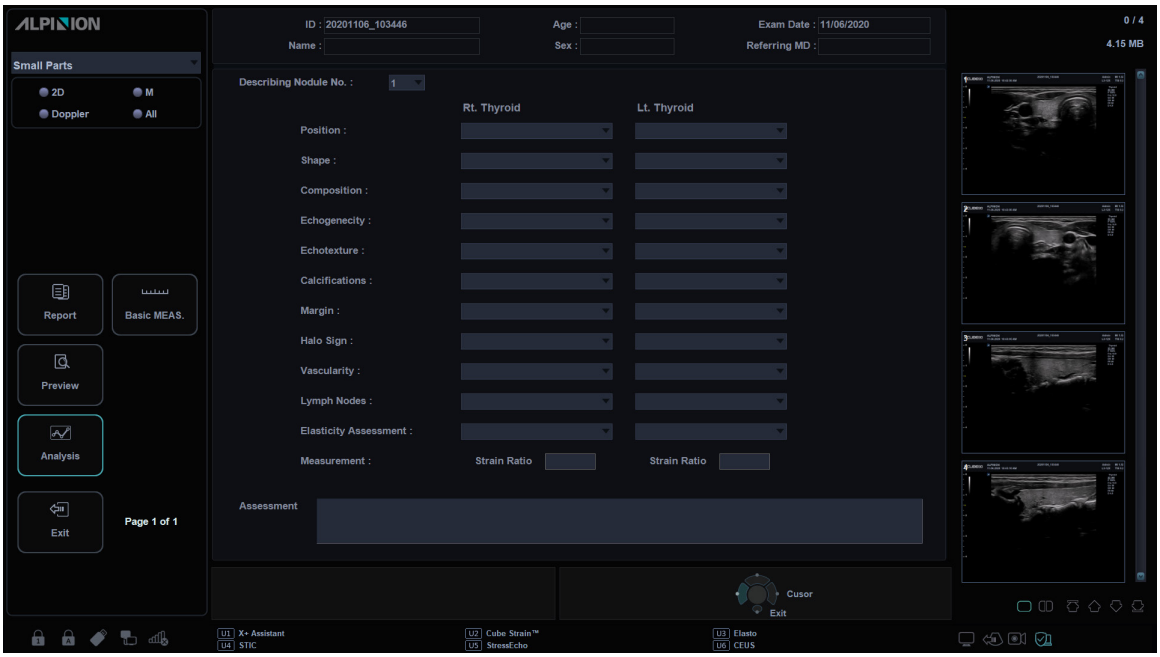


Figure 9-6 Thyroid Analysis

Analysis lists

Table 9-40 Thyroid nodule analysis lists

List	Descriptive data	Options
Position	**Superior Anterior**	
	Superior Posterior	
	Medium Anterior	
	Medium Posterior	
	Inferior Anterior	
	Inferior Posterior	
	Isthmus	

List	Descriptive data	Options
Shape	Round	
	Wider than tall	
	Taller than wide	
	Irregular	
Composition	Solid	
	Predominately Solid	
	Predominately Cystic	
	Cystic	
	Spongiform	
Echogenecity	Markedly Hypoechoic	
	Hypoechoic	
	Isoechoic	
	Hyperechoic	
Echotexture	Homogeneous	
	Heterogeneous	
Calcifications	Absent	
	Micro Ca++	
	Macro Ca++	
	Peripheral rim Ca++	
Margin	Well-defined	Regular, Irregular
	Ill-defined	Regular, Irregular
Halo sign	Absent	
	Complete	Thin, Thick
	Partial	Thin, Thick
Vascularity	Absent	
	Perinodular	
	Peri-Intranodular	
Lymph Nodes	Normal	
	Suspect	Intramammary, Axillary
Elasticity Assessment	Soft	
	Intermediate	
	Hard	

List	Descriptive data	Options
Measurement	**Strain Ratio**	
TI-RADS Classification	**TR1, TR2, TR3, TR4, TR5**	
Assessment		

NOTE

TI-RADS is a trademarks of the American College of Radiology.

TI-RADS risk-stratification system

Review the TI-RADS risk-stratification system,

– While viewing the thyroid report, select **TI-RADS** on the context menu.

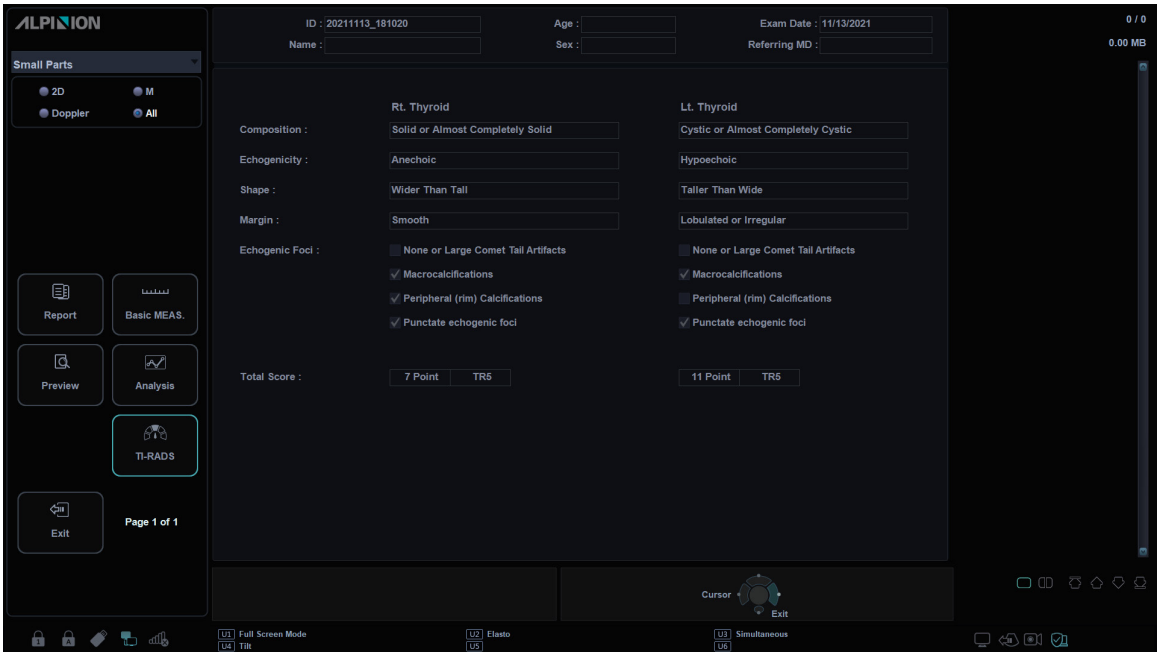


Figure 9-7 TI-RADS risk-stratification system

Table 9-41 TI-RADS classification lists

Classification list	Descriptive data	Options
Composition (Choose 1)	**Cystic or almost completely cystic**	**0 points**
	Spongiform	**0 points**
	Mixed cystic and solid	**1 points**
	Solid or almost completely solid	**2 points**

Classification list	Descriptive data	Options
Echogenicity (Choose 1)	Anechoic	0 points
	Hyperechoic or isoechoic	1 points
	Hyperechoic	2 points
	Very hyperechoic	3 points
Shape (Choose 1)	Wider-than-tall	0 points
	Taller-than-wide	3 points
Margin (Choose 1)	Smoth	0 points
	Ill-defined	0 points
	Lobulated or irregular	2 points
	Extra-thyroidal extension	3 points
Echogenic foci (Choose All That Apply)	None or large comet-tail artifacts	0 points
	Macrocalcifications	1 points
	Peripheral (rim) calcifications	2 points
	Punctate echogenic foci	3 points

Table 9-42 TI-RADS lesion Level lists

Level list	Descriptive data	Options
TR1 - 0 Points	Benign	
TR2 - 2 Points	Not Suspicious	
TR3 - 3 Points	Midly Suspicious	
TR4 - 4 to 6 Points	Moderately Suspicious	
TR5 - 7+ Points	Highly Suspicious	

Breast

Breast Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 9-43 2D mode measurement (Breast)

Measurement	Description
Mass# 1–10	Measurements of the left and right breast mass
Mass L	Mass Length
Mass H	Mass Height
Mass W	Mass Width
Mass Nip-Mass D	Mass Nipple Mass Diameter
Mass Skin-Mass D	Mass Skin Mass Diameter
Mass Vol	Mass Volume
Duct Dilatation	Duct Dilatation

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Breast** > **2D** > **Default Measurement**.

Mass Volume

You can make the breast mass volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the Mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the Mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

3 Distances Volume

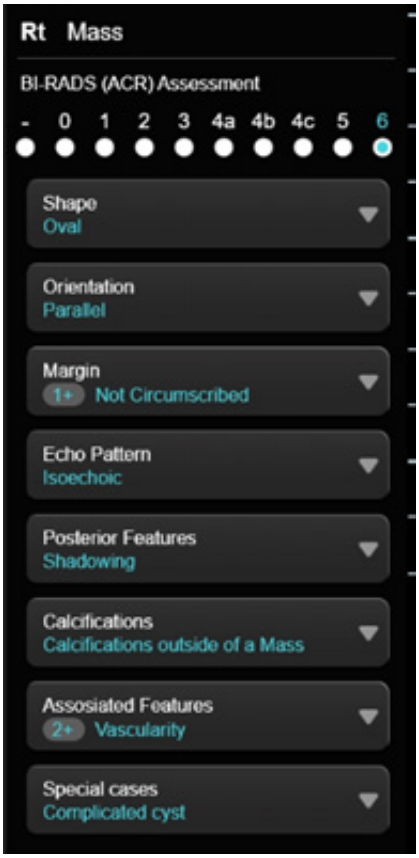
1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d). When three distances are measured, the volume is calculated.
4. The measured value is fixed, and the Mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

NOTE

To configure the Mass volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Breast** > **Edit**.

BI-RADS Assessment

1. Register the Patient ID.
2. Press the **[Measure]** key on the control panel.
3. Select the **BI-RADS** on the soft menu.
4. Evaluation list of the BI-RADS appears on the context menu.



5. After assessment of each item, enter the **Report** page.

NOTE

TI-RADS is not supported while using the Full Screen mode or X+ Assistant.

M mode measurements

M mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 9-44 M mode measurement (Breast)

Measurement	Description
Distance	Distance
Time	Time
Slope	Slope
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Breast** > **M** > **Default Measurement**.

Distance

1. Select **Distance** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

Time

1. Select **Time** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 9-45 D mode measurement (Breast)

Measurement	Description
Breast Flow	Breast Flow
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Breast** > **Doppler** > **Default Measurement**.

Breast Report

The breast report has three sections of information:

- Patient information
- Measurement information
- Breast analysis

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report function, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Breast Analysis

To start the breast analysis,

– While viewing the breast report, select **Analysis** on the context menu.

NOTE

The patient specific contents input on the Analysis page are returned to the factory default settings after starting a new patient.

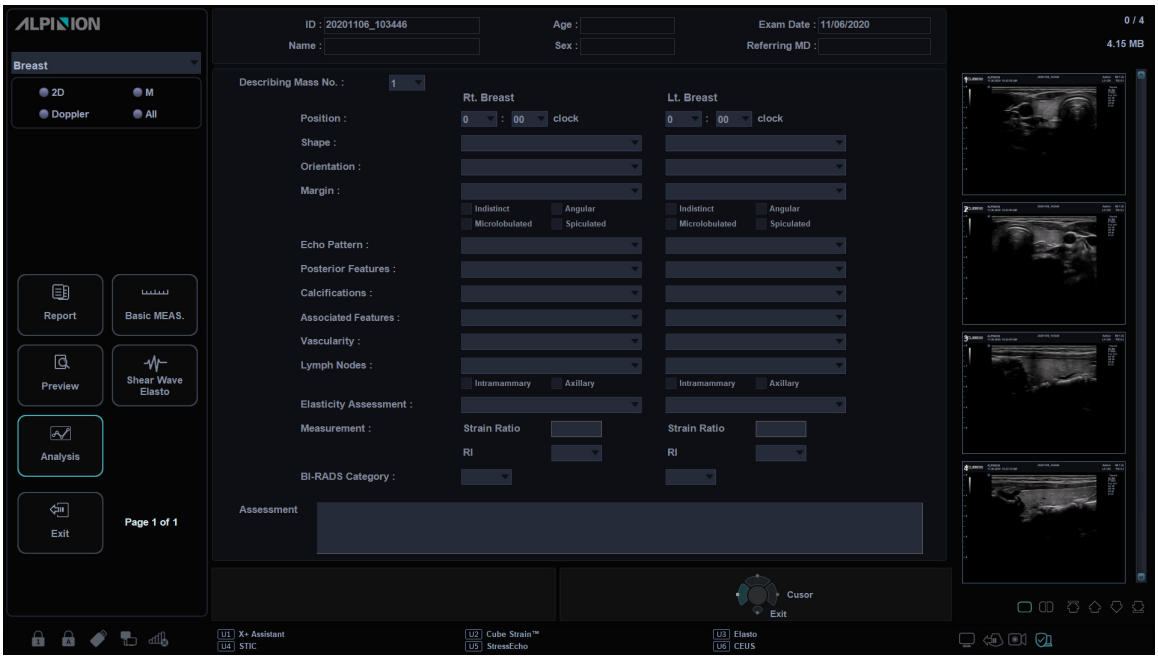


Figure 9-8 Breast Analysis

Analysis lists

Table 9-46 Breast mass analysis lists

List	Descriptive data	Options
Position	(0–12):(00,30) o'clock	
Shape	Round	
	Oval	
	Irregular	
Orientation	Wider than tall	
	Taller than wide	
Margin	Circumscribed	
	Not circumscribed	Indistinct, Angular, Microlobulated, Spiculated

List	Descriptive data	Options
Echo Pattern	Anechoic	
	Hyperechoic	
	Complex cystic and solid	
	Hypoechoic	
	Isoechoic	
	Heterogeneous	
Posterior Features	No posterior feature	
	Enhancement	
	Shadowing	
	Combined pattern	
Calcifications	Not Present	
	Macro Ca++	
	Micro Ca++ in a mass	
	Micro Ca++ outside of a mass	
	Intraductal Ca++	
Associated Features	Architectural distortion	(Blank)
	Duct change	
	Skin thickening	
	Skin retraction	
	Edema	
Vascularity	Not present	
	Vessels in rim	
	Internal vascularity	
Lymph Nodes	Normal	
	Suspect	Intramammary, Axillary
Elasticity Assessment	Soft	
	Intermediate	
	Hard	
Measurement	Strain Ratio	
	RI	< 0.70, ≥ 0.70

List	Descriptive data	Options
BI-RADS Classification	**Shape, Orientation, Margin, Echo Pattern, Posterior features, Calcifications, Associated features, Special cases**	
Assessment		

NOTE

BI-RADS is a trademarks of the American College of Radiology.

BI-RADS lesion classification

Review the BI-RADS lesion classification,

– While viewing the breast report, select **BI-RADS** on the context menu.

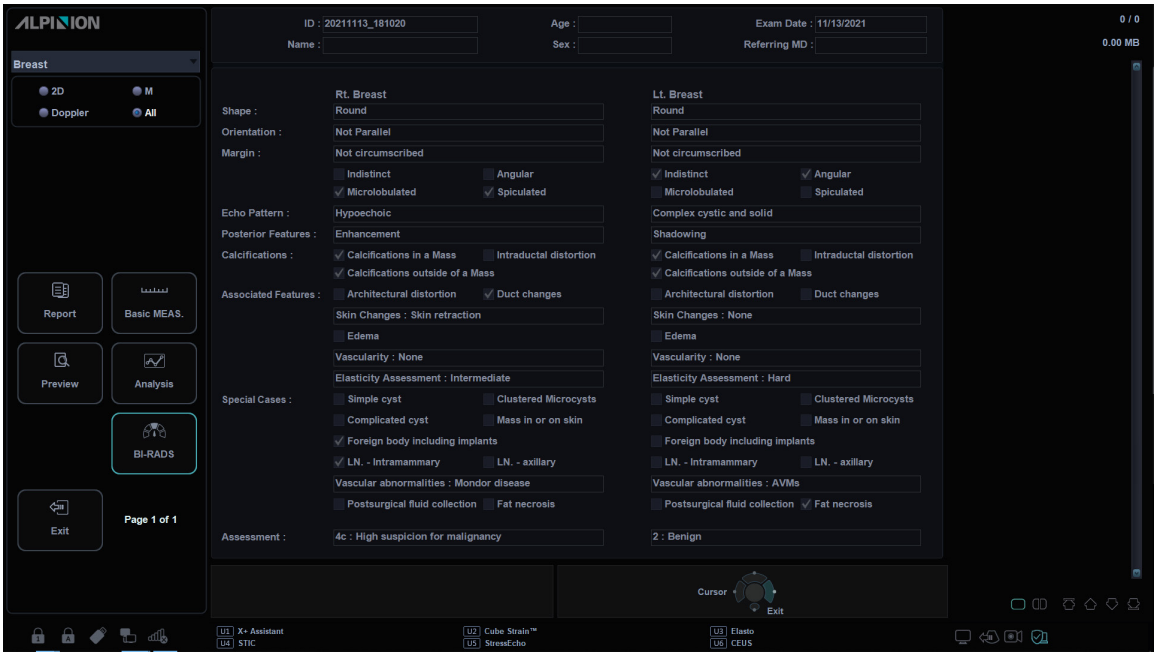


Figure 9-9 BI-RADS lesion classification

Table 9-47 BI-RADS classification lists

Classification list	Descriptive data	Options
Shape	Oval	
	Round	
	Irregular	
Orientation	Parallel	
	Not Parallel	
Margin	Circumscribed	
	Not circumscribed	Indistinct, Angular, Microlobulated, Spiculated
Echo Pattern	Anechoic	
	Hyperechoic	
	Complex cystic and solid	
	Hypoechoic	
	Isoechoic	
	Heterogeneous	

Classification list	Descriptive data	Options
Posterior Features	No posterior feature	
	Enhancement	
	Shadowing	
	Combined pattern	
Calcifications	Calcifications in a mass	
	Calcifications outside of a mass	
	Intraductal calcificatios	
Associated Features	Architectural distortion	
	Duct changes	
	Skin changes	Skin thickening, Skin retraction
	Edema	
	Vascularity	Absent, Internal vascularity, Vessels in rim
	Elasticity Assessment	Soft, Intermediate, Hard
Special cases	Simple cyst	
	Clustered microcysts	
	Complicated cyst	
	Mass in or on skin	
	Foreign body including implants	
	Lymph nodes - intramammary	
	Lymph nodes - axillary	
	Vascular abnormalities	AVMs (Arteriovenous malformations/ pseudoaneurysms), Mondor disease
	Postsurgical fluid collection	
	Fat necrosis	

Musculoskeletal (MSK)

MSK Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 9-48 2D mode measurement (MSK)

Measurement	Description
Volume	Volume
Hip(BA)	The system calculates and shows angles β and α.
Hip(AB)	The system calculates and shows angles α and β.
Hip(Rotate)	Hip Angle (Type to measure by rotating the angle key)
d:D	d/D (the ratio of acetabular depth to diameter of the femoral head)

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **MSK** > **2D** > **Default Measurement**.

Volume

You can make the volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

3 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

NOTE

To configure the volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **MSK** > **Edit**.

Hip(BA)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the beta angle (β). The third line establishes the alpha angle (α).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Hip(BA)**. The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The baseline is completed.
5. Perform the measurement for the second (β) and third (α) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

Hip(AB)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the alpha angle (α). The third line establishes the beta angle (β).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Hip(AB)**. The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The baseline is completed.
5. Perform the measurement for the second (α) and third (β) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

M mode measurements

M mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 9-49 M mode measurement (MSK)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **MSK** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 9-50 D mode measurement (MSK)

Measurement	Description
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **MSK** > **Doppler** > **Default Measurement**.

MSK Report

The MSK report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Emergency Medicine (EM)

EM Measurements and Calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 9-51 2D mode measurement (EM)

Measurement	Description
Aorta	Aorta
Renal L	Renal Length
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Bladder Vol	Bladder Volume

NOTE

To configure the default measurement for 2D mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **EM** > **2D** > **Default Measurement**.

Aorta Diameter

1. Select **Aorta** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the aorta diameter (**Aorta**) is shown on the ***Result*** window.

Renal Length

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal L**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the renal length (**Rt** or **Lt Renal L**) is shown on the ***Result*** window.

Bladder Volume (1)

You can measure the length, width, and height of the bladder. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Bladder** folder on the context menu.
2. Select **Bladder L**, **Bladder H**, or **Bladder W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the bladder volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

Bladder Volume (2)

1. Select **Bladder Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the bladder volume method, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **EM** > **Bladder Vol** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 9-52 M mode measurement (EM)

Measurement	Description
%Stenosis	Two Diameters Percent Stenosis
A/B Ratio	Two Diameters Ratio
HR	Heart Rate

NOTE

To configure the default measurement for M mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **EM** > **M** > **Default Measurement**.

%Stenosis (Diameter)

1. Select **%Stenosis** on the context menu. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set**] key.
4. The two diameters percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

A/B Ratio (Diameter)

1. Select **A/B Ratio** on the context menu. The start point appears.
2. Measure the first diameter (**A**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second diameter (**B**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated and two diameters ratio (**A/B Ratio**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 9-53 D mode measurement (EM)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
IVC	Inferior Vena Cava
Uterine A	Uterine Artery
Ovarian A	Ovarian Artery
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **EM** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurements for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default package measurement for Doppler mode, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **EM** > **Doppler** > **Package measurement** > a default measurement.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
2. The vertical line and the horizontal line are perpendicular to each other.
3. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
5. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball**] to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again. The end point is fixed.
4. The resistive index is calculated, and the resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum value of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated, and the maximum time-average (**TAmax)** is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

EM Report

The EM report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Patient Worksheets (Reports)" on page 8-29.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit tahe patient information, go to ***Patient*** screen.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a Worksheet" on page 8-32.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

10

Recording Images

This chapter describes how to record images.

Storing Images and Cine Loops

The Images and cine loops that are stored during a current exam are displayed as thumbnails on the clipboard.

When an image is stored, all information that is displayed is saved with it (i.e. transducer and application, image settings, annotations or measurement results).

Storing an Image

To store an image,

1. While scanning, press the **[Freeze]** key on the control panel.
2. Using **[Trackball]** to scroll through the cine loop and select the desired image.
3. Press the **[P1]** key (or the assigned print key) on the control panel.
   The selected image is stored and a thumbnail is displayed on the clipboard.

Storing a Cine Loop

A cine loop is a sequence of images recorded over a certain time frame. The cine loops can be stored at any time during scanning.

The system can be configured to perform one of the following:

- **Retrospective**: The system stores cine for a specified time before you press the **[P1]** key (or the assigned print key).
- **Prospective**: The system begins storing cine from when you press the **[P1]** key (or the assigned print key).

To store a cine loop,

1. Go to **Utility** > **Setup** > **ImagePreset** > **General** > **Cine Loop Store**, and define the number of cycles or seconds to store.
   - **Cine Time Span(no ECG)[s]**: Select the number of seconds of cine loop storage. The default is 3 seconds.
   - **Number of heart cycles**: Select the number of heart cycles to store.
   - **Cine Loop Store**: Select to store a cine loop retrospectively or prospectively. (**Prospective** or **Retrospective**)
2. When you have finished, click **Save & Exit** to save the changes and return to scanning.
3. Perform the scan.
4. While scanning, press the **[P1]** key (or the assigned print key) on the control panel.
5. The last valid cine loop is stored in the archive and a thumbnail with the video icon () is displayed on the clipboard.

Clipboard

The clipboard displays thumbnail images of the data acquired in the current exam.

Image Clipboard

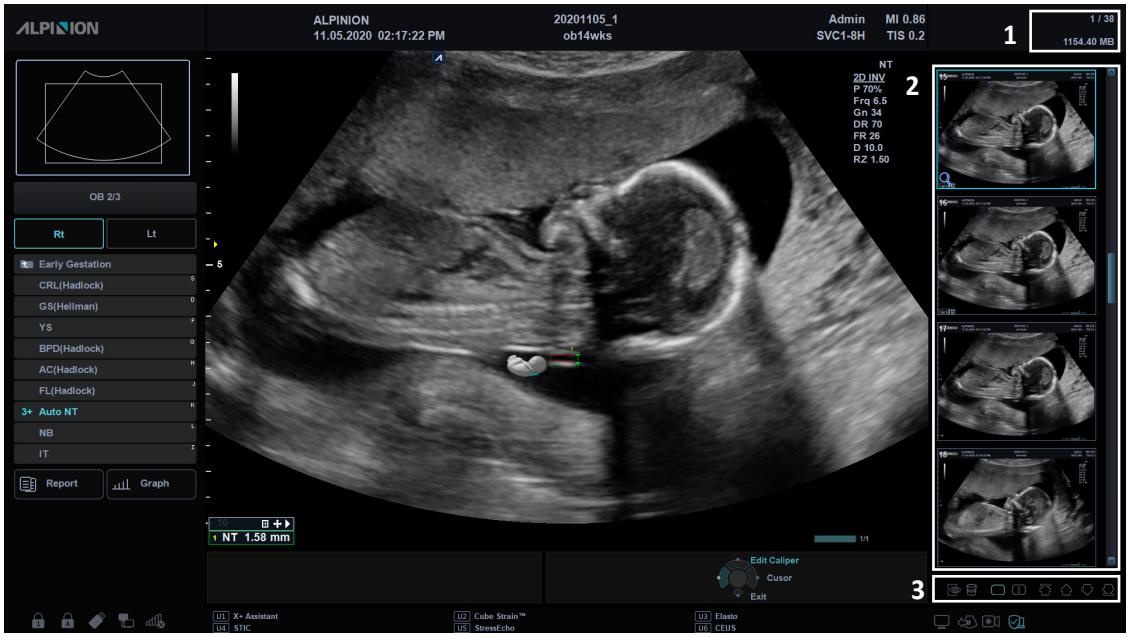


Figure 10-1 Image Clipboard

1	Clipboard indicators	**3**	Clipboard icons
2	Image clipboard		

- The number on the top left corner of the thumbnail image denotes the consecutive order for saving.
- The video icon on the bottom right side of the thumbnail image denotes the cine loop that is possible to post processing.
- On the top of the clipboard, the clipboard indicators show the total capacity and number of images.
- To delete the selected thumbnail image, click the trash can icon ( ) on the bottom right.
- To change the clipboard window layout, click the single layout icon ( ) or dual layout icon ( ) on the bottom right.

Saving Images to the Clipboard

The active images are stored and placed on the clipboard when you press the print key. You can see thumbnail images on the clipboard.

NOTE

The print key is programmable. You can assign the P1, P2, P3 and P4 key functions in **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.

Previewing Clipboard Images

1. To activate Thumbnail Preview, click the Thumbnail Preview icon ( ) on the bottom right.
2. Move the cursor over the thumbnail images on the clipboard. The magnified thumbnail image is displayed in the screen.
3. To deactivate Thumbnail Preview, click the Thumbnail Preview icon ( ) again.

Recalling Images from the Clipboard

To recall images from the clipboard,

1. Press the **[Cursor]** key to obtain the cursor.
2. Move the cursor over the image you want to reload by using **[Trackball]** and press the **[Set]** key.
3. Press the **[Set]** key to reload the selected image on the full screen image.
   You can also double-click a thumbnail image to reload an image. To scroll the page, click the arrow mark of the scroll bar to move up and down.

Deleting Images from the Clipboard

To delete an image from the clipboard,

1. Press the **[Cursor]** key to obtain the cursor.
2. Move the cursor over the image you want to delete by using **[Trackball]** and press the **[Set]** key.
3. Click the trash can icon ( ) on the bottom right.
4. When the confirmation dialog box appears, click **Yes** to delete the image.

Saving Images Permanently

1. Touch **E-View** on the touch screen. The images on the clipboard appear expanded.
2. Use **[Trackball]** to select an image or multiple images and press the **[Set]** key.
   To select all images, select **Select All**. To reverse the current selection, select **Select Inverse**.
3. Select **Archive** on the touch screen to save the image(s).

E-View

The system provides the E-View feature that allows fast and easy image management. The E-View feature allows you to view the whole patient from local database or removable media, export/import, save as with PC friendly format and send DICOM images to remote server over the network. And it allows you to open an already existing patient exam.

CAUTION

You may lose patient information files such as patient's basic information and scanned images because of physical shocks to the product or internal errors. Therefore, you should back up patient's basic information and scanned images on a regular basis. See "Backup / Restore" on page 5-49 for more information. ALPINION MEDICAL SYSTEMS does not have the responsibility for data loss caused by the user's carelessness.

To activate the E-View feature,

– Touch **E-View** on the touch screen.

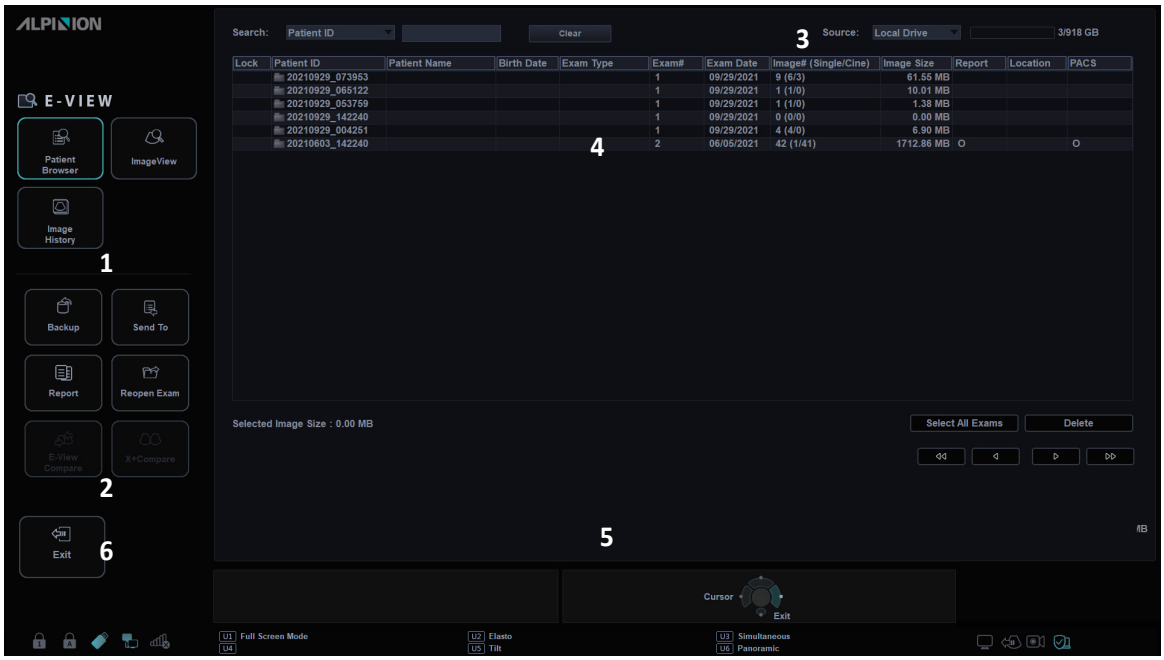


Figure 10-2 E-View Display

1	Menu selection	**4**	Patient list/Study list
2	Function selection	**5**	Image area
3	Source information	**6**	Exit

Patient Browser

Patient Browser allows you to search and quick view for patients and studies from the local hard disk drive (HDD) or a removable media.

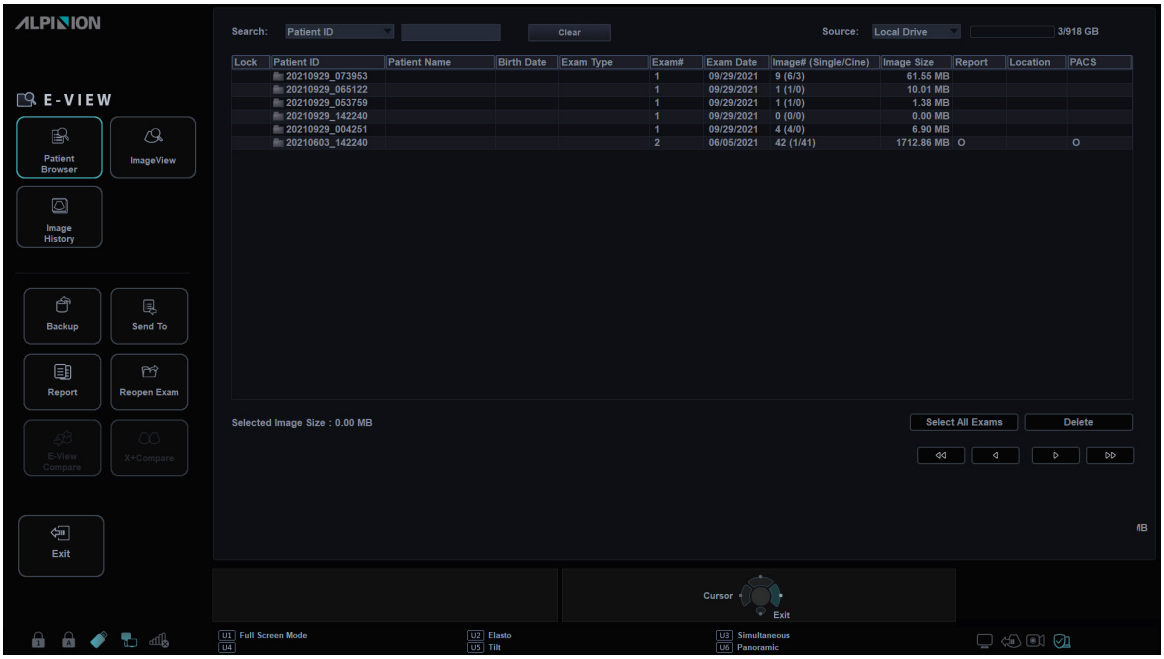


Figure 10-3 Patient Browser Display

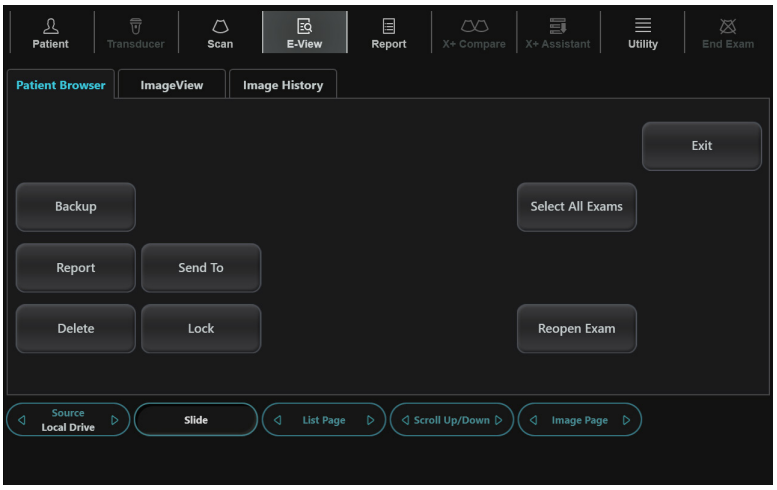


Figure 10-4 Patient Browser Touch Screen

Table 10-1 E-View (Patient Browser) touch screen description

Parameter	Description
Function selection	• **Backup**: Export the exam information. • **Send To**: Send the saved images through the network. • **Report**: Access Worksheet page. • **Reopen Exam**: Reopen an already existing exam.
Lock/Unlock	Lock the patient data or study. Prevent move and delete functions.
Select All Exams	Select all exams.
Delete	Delete the patient data or study.
Exit	Use to exit the ***E-View*** screen.

To activate Patient Browser,

1 Select a source from the ***Source*** drop-down list.

2 To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.

3 Select the desired patient from the patient list.

Backup

To move exam(s) between compatible systems or to back up and retrieve, use **Backup** menu. You can use the following types of media for performing data backup: CD, DVD, USB HDD, USB flash drive.

NOTE

Make sure that your media is appropriate for exporting or importing images. If any problem occurs, eject the media and retry the task.

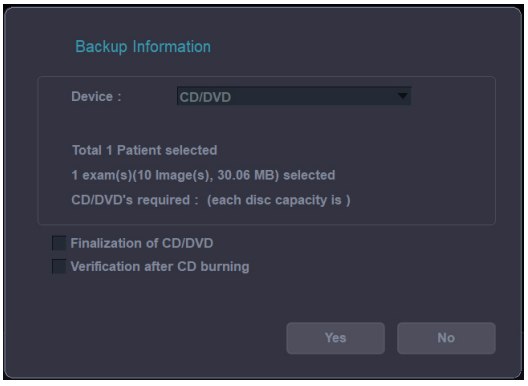
To export from the local HDD to a removable media,

1 Insert your removable media to the media tray properly.

2 Select **Local HDD** from the ***Source*** drop-down list.

3 Select the patient(s) from the patient list.

4 Select **Backup** on the touch screen, or select **Backup** on the function selection.
The dialog box appears.



5 Select a media from the ***Device*** drop-down list.

6 If you select **USB** or **USB HDD** from the ***Device*** drop-down list, you can enter the description such as information or comment.

7 If you select **CD/DVD** from the ***Device*** drop-down list, you can use the following options:

- **Finalization of CD/DVD**: Finalize the CD or DVD to prevent from further writing.
- **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.

8 Click **Yes**. The status information is displayed in the Backup Spooler during exporting files.

Backup Spooler

Backup spooler displays all backups which have been sent or which have been failed.

To enter the Backup spooler, press the **[DICOM Spooler]** key on the QWERTY keyboard, and then select the **Backup** tab. You can control or monitor backup jobs. From the Back spooler, you can retry, delete, or redirect job.

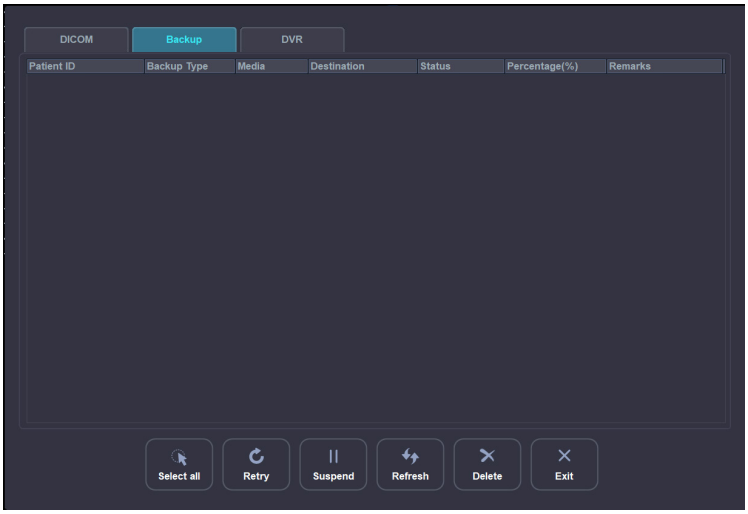


Figure 10-5 Backup Spooler

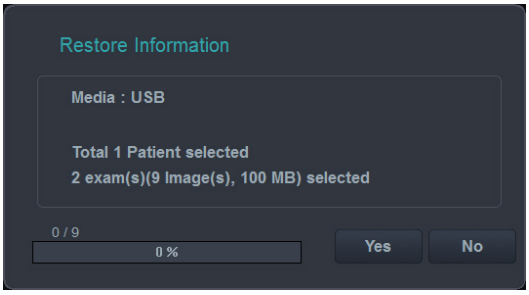
To restore from a removable media to the local HDD,

1 Insert a media that contains patient data.

2 Select a removable media from the ***Source*** drop-down list.

3 Select the patient(s) from the patient list.

4 Click **Restore**. The progress bar appears while importing files.



5 To eject the removable media (for CD or DVD), press the **[Eject]** key on the QWERTY keyboard.

Send To

Send To allows you to save images or studies from your PC to a storage media such as CD, DVD, USB flash drive, USB hard disk, and network storage. Before saving, make sure that the removable media is placed in the right position.

CD/DVD, USB/USB HDD, Network

1. Select **Local HDD** from the ***Source*** drop-down list.
2. Select the patient(s) from the patient list.
3. Insert your removable media to the media tray properly.

   NOTE

   To configure the network storage, go to **Utility** > **Setup** > **SystemPreset** > **Connectivity** > **General** > **Network Storage**.

4. Select **Send To** on the touch screen, or select **Send To** on the function selection.
   The dialog box appears.

5. Select a storage media type on the left of the dialog box.
6. Select a media from the ***Device*** drop-down list.

   NOTE

   If you select **USB**, **USB HDD**, or **Network Drive** from the ***Device*** drop-down list, you can add or delete folders by using the add folder icon ( ) or delete folder icon ( ).

7. If you select **CD/DVD**, **USB/USB HDD** or **Network**, you can use the following options:
   - **Generate DICOMDIR file**: Save the patient data as DICOMDIR file.
   - **Finalization of CD/DVD**: Finalize the CD or DVD to prevent from further writing.
   - **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.
8. The system automatically creates a file name.
   To change the file name, select the **Edit File Name** check box and enter a file name in the ***File Name*** field.

9 Select an image format in the ***Type*** field.
To save cine images as a video file, skip to step 12.

Table 10-2 Image format

Format	Function
DCM	Save a still image as standard DICOM format. It is possible to specify compression type and quality.
BMP	Save a still image as BMP format.
JPEG	Save a still image as JPEG format. It is possible to specify compression type and quality.

NOTE

To view a DICOM format image on your PC, you need a dedicated DICOM viewer.

10 If you selected **DCM** in step 9, select a compression type in the ***Compression*** field.

11 If you selected **JPEG** in step 9, select an image quality in the ***Quality*** field.

12 Select a video file format.

- **2D Cine**: Save 2D cine Images as WMV or AVI format.
- **4D Volume Cine(*AVI)**: Save 4D volume cine images as AVI format.

13 When you have finished, click **Save**.

PACS

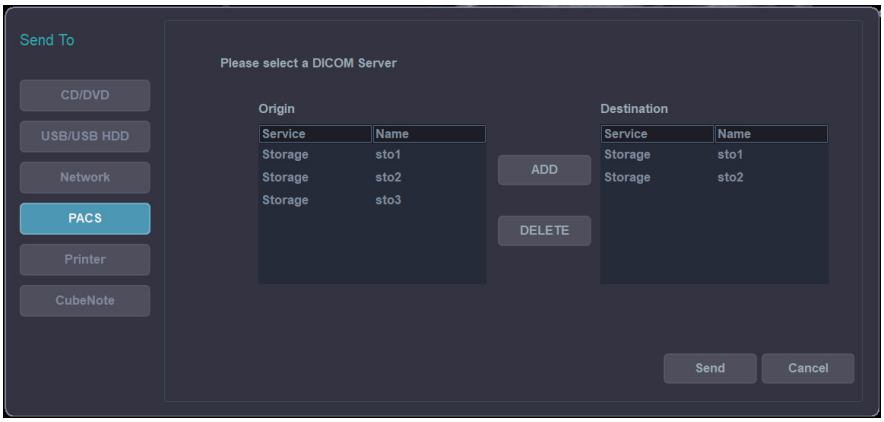
PACS allows you to transfer patient(s) data to the DICOM device such as DICOM Storage or DICOM Print.

To send from the local HDD to a DICOM device,

1 Select **Local HDD** from the ***Source*** drop-down list.

2 Select the patient(s) from the patient list.

3 Select **Send To** on the touch screen, or select **Send To** on the function selection.
The dialog box appears.



4 Select **PACS** on the left of the dialog box.

5 Select a destination device from the ***DICOM Server*** drop-down list.

NOTE

You can configure the destination device. To configure, go to **Utility** > **Setup** > **SystemPreset** > **Connectivity** > **Storage**.

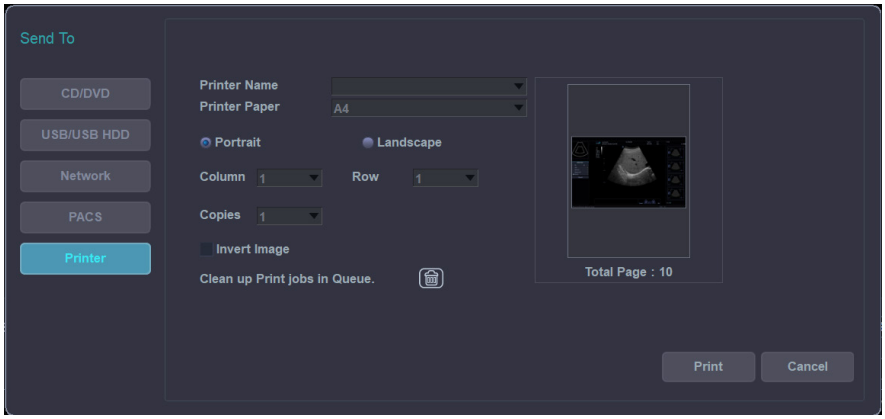
6 Click **Send**. The progress bar appears during transferring files.

Printer

1 Select **Local HDD** from the ***Source*** drop-down list.

2 Select the patient(s) from the patient list.

3 Select **Send To** on the touch screen, or select **Send To** on the function selection.
The dialog box appears.



4 Select **Printer** on the left of the dialog box.

5 Select a standard (default) printer and set up the printing options.

NOTE

To configure the standard printer, go to **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral** > **Standard Printer**.

6 When you have finished, click **Print**.
The selected printer prints out the selected image(s).

NOTE

To invert color between images and background, select the **Invert Image** check box.

Report

Report allows you to access Worksheet page.

Reopen Exam

Reopen Exam allows you to open an already existing exam. The reopened exam is now the current exam and can be closed by touching **End Exam** on the touch screen.

NOTE

You cannot reopen exams, which are older than 24 hours.

To open the selected exam,

1. Select a desired patient from the patient list.
2. Select **Reopen Exam** on the touch screen, or select **Reopen Exam** on the function selection. The scan screen appears.
3. Edit an image and save it.
4. To end the current exam, touch **End Exam** on the touch screen.

Importing the Data from a DICOM Server (DICOM Q&R)

Exams, patients and images from a DICOM server can be imported after DICOM Query/Retrieve was performed. It is only possible to import complete exams or patients, not single selected images.

NOTE

- For query/retrieve to find a patient, the patient must have a Patient ID.
- Before retrieving data from a DICOM server, you need to configure DICOM Q&R settings. To configure DICOM Q&R settings, go to **Utility** > **Setup** > **SystemPreset** > **Connectivity** > **DICOM Q&R**.

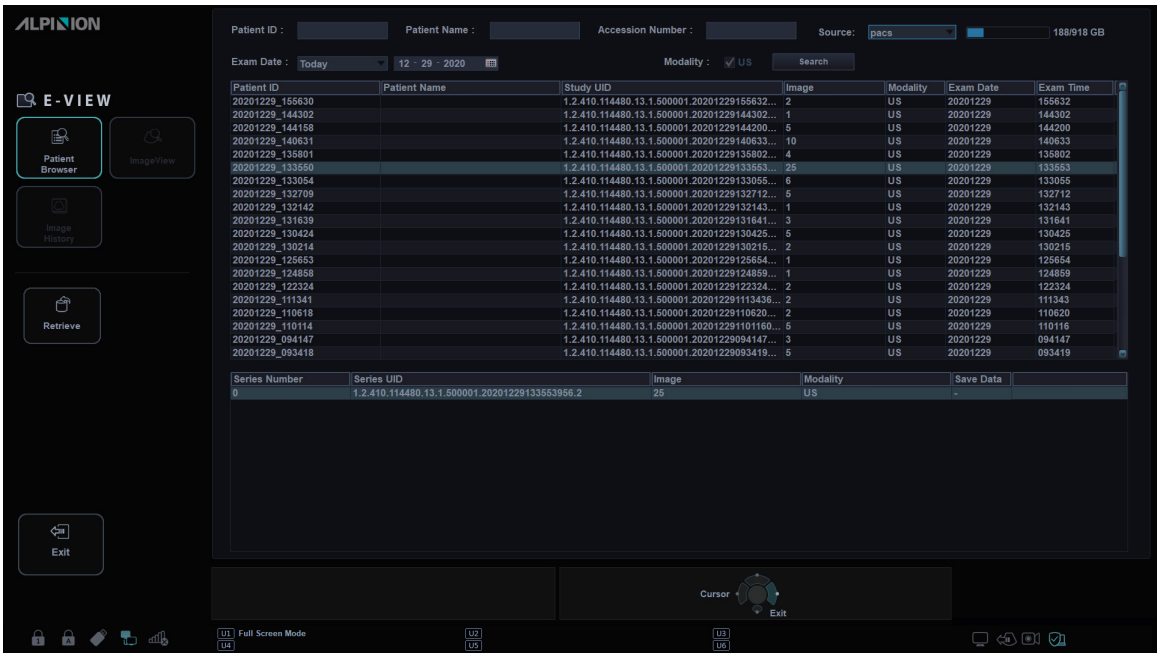


Figure 10-6 DICOM Q/R Screen Display

To retrieve images from a DICOM server,

1. Touch **E-View** on the touch screen.
   The Patient Browser page appears.
2. Select the server from the ***Source*** drop-down list.
   The DICOM Q/R page appears.
3. Enter data in either ***Patient ID***, ***Patient Name***, or ***Accession Number*** fields to search.
4. Specify the exam date in the ***Exam Date*** field.
5. Click **Search** to perform a search.
   Patient ID, Patient Name, Study UID, Image Cound, Modality, Exam Date, and Exam Time appear on the Study List search result.
6. Select a study on the Study List to search series.
   Series Number, Series UID, Image Count, Modality, and Save Data appear on the Series List search result.
7. Select the series you wish to retrieve, and select **Retrieve** on the touch screen.
   The progress bar appears during transferring files.

Image View

Image View allows you to view the selected images from list view. You can change the display layout.

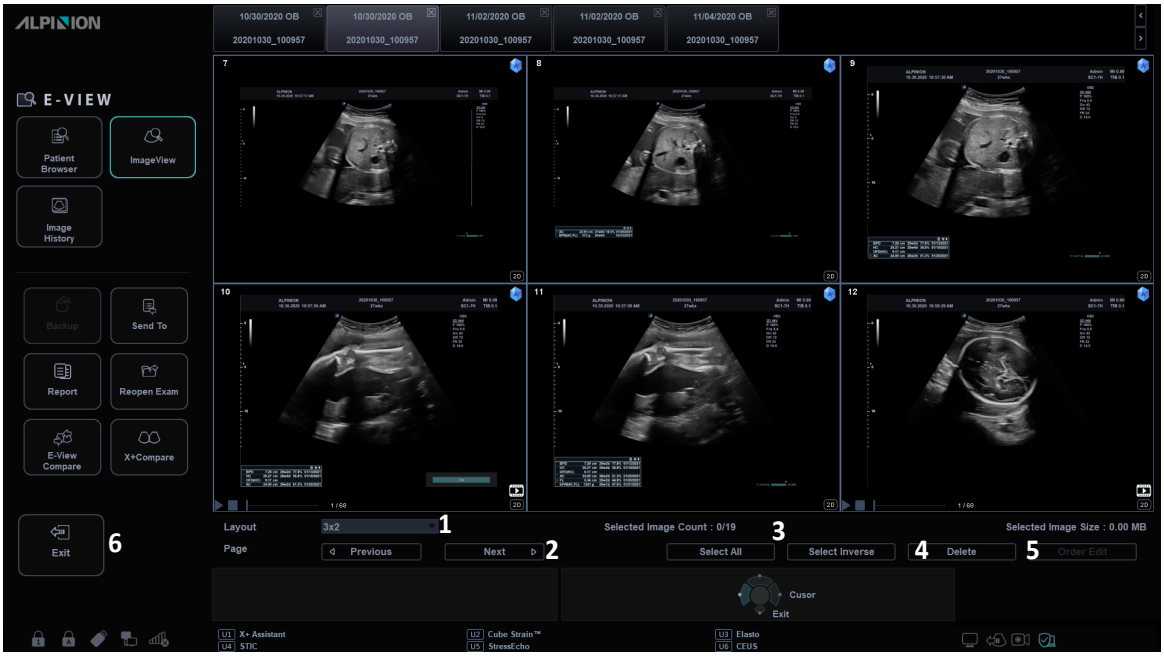


Figure 10-7 Image View Display

1	Layout selection	**4**	Delete
2	Page selection	**5**	Order Edit
3	Select All/Select Inverse	**6**	Exit

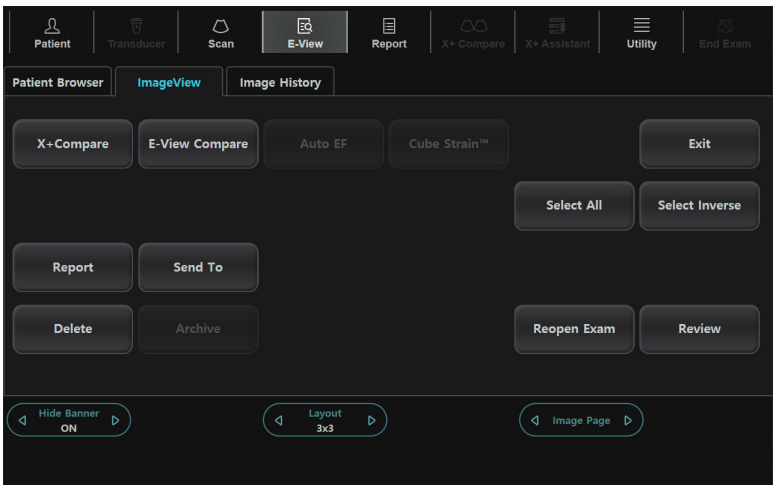


Figure 10-8 Image View Touch Screen

Table 10-3 E-View (Image View) touch screen description

Parameter	Description
Function selection	• **Review**: Review an image. The image is shown on the scan screen. • **Send To**: Send the saved images through the network. • **Report**: Access Worksheet page. • **Reopen Exam**: Reopen an already existing exam. • **E-View Compare**: View images side-by-side from two different exams on the same patient. • **X+ Compare**: Compare the archived images to a live image.
Archive	Store the image(s) in the local hard disk.
Select All	Select all images.
Select Inverse	Reverse the current selection.
Delete	Delete the selected image(s).
Order Edit	Use to change the order of images.
Exit	Use to exit the ***E-View*** screen.
Hide Banner	Use to hide patient banner on acquired data..
Layout	Select a display format from 1X1, 1X2, 2X2, 3X3 and 4X4.
Image Page	Use to move to the next page.

To activate Image View,

1. Select a source from the ***Source*** drop-down list.
2. To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.
3. Select the desired patient from the patient list.
4. Select **ImageView** on the touch screen, or select **ImageView** on the menu selection.

Review

To review an image,

1. Select the desired image.
2. Select **Review** on the touch screen. The image is shown on the scan screen.

Send To_CubeNote

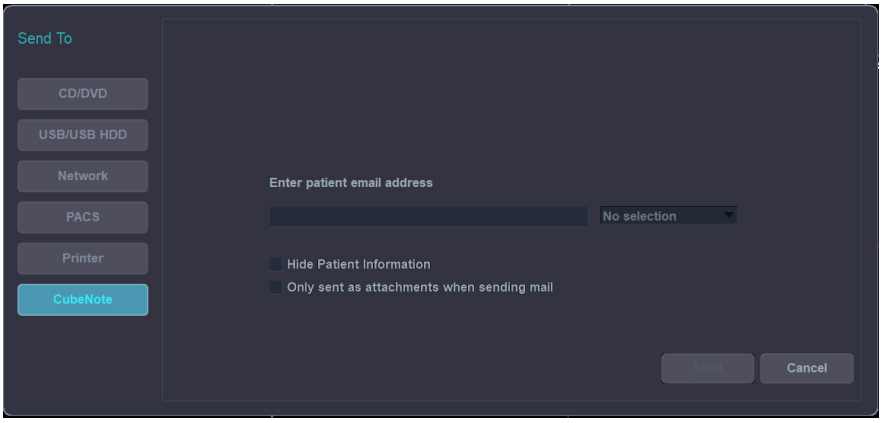
CubeNote allows you to send saved images to remote server and review the images through CubeNote app in your mobile device.

NOTE

For using this feature, you need an additional request to your local agent.

To send saved images to CubeNote Control Server,

1. Select the image(s).
2. Select **Send To** on the touch screen, or select **Send To** on the function selection. The dialog box appears.



3. Select **CubeNote** on the left of the dialog box.
4. Enter an e-mail address.
5. You can use the following options:
   - **Hide Patient Information**: The patient information is removed from the images.
   - **Only sent as attachments when sending mail**: The selected images can be sent only by e-mail attachment.
6. Click **Send**. The status information is displayed in the Spooler during transferring files.

E-View Compare

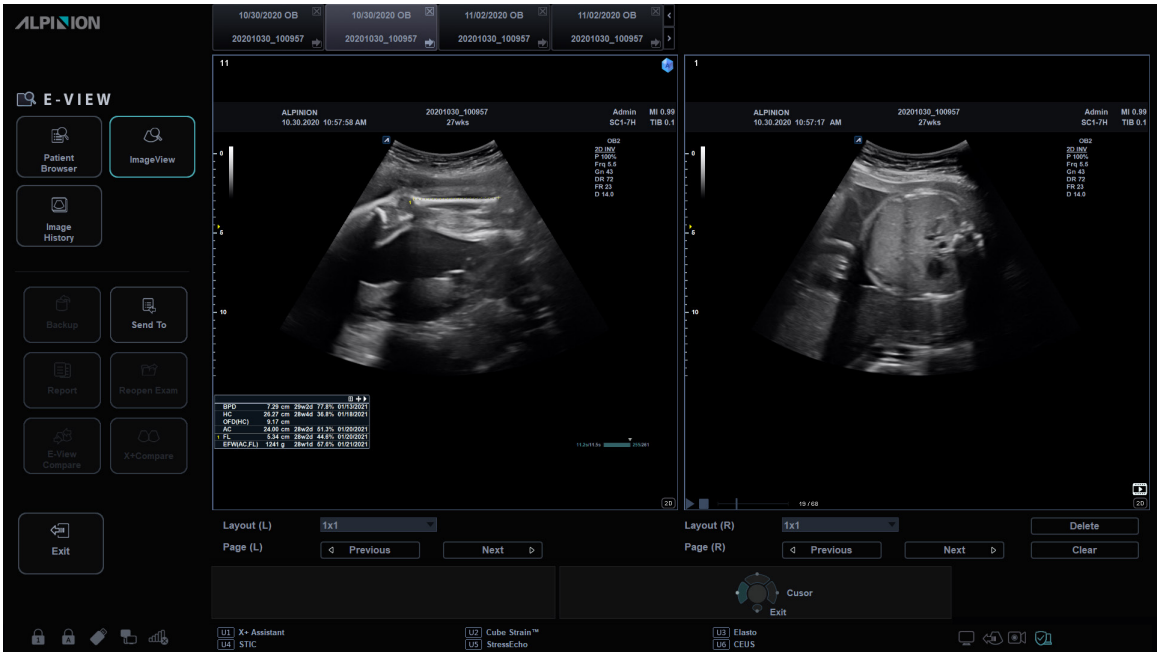


Figure 10-9 E-View Compare Display

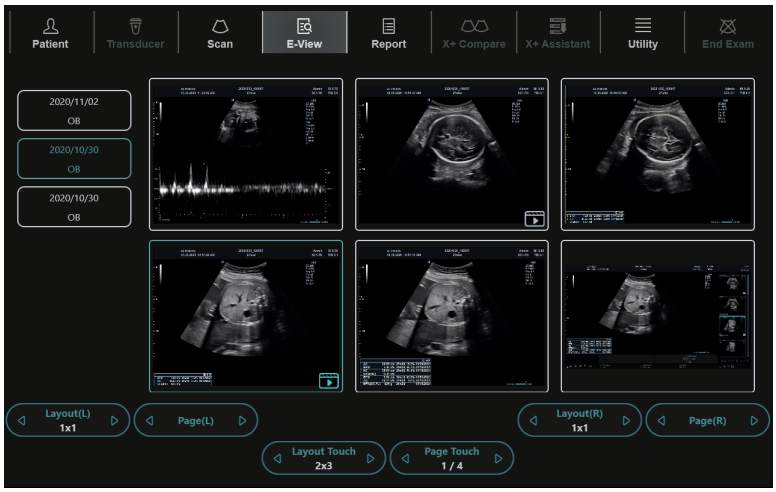


Figure 10-10 E-View Compare Touch Screen

To view images side-by-side from two different studies on the same patient,

1. Select the patient on the Patient Browser page.
2. Select **ImageView** on the touch screen, or select **ImageView** on the menu selection.
   Image View page appears.
3. Select **E-View Compare** on the touch screen, or select **E-View Compare** on the menu selection.
   The patient's exam lists and images appear on the touch screen.
4. Select the desired image(s) on the touch screen.
5. Select the desired comparison image(s) on the touch screen.

X+ Compare

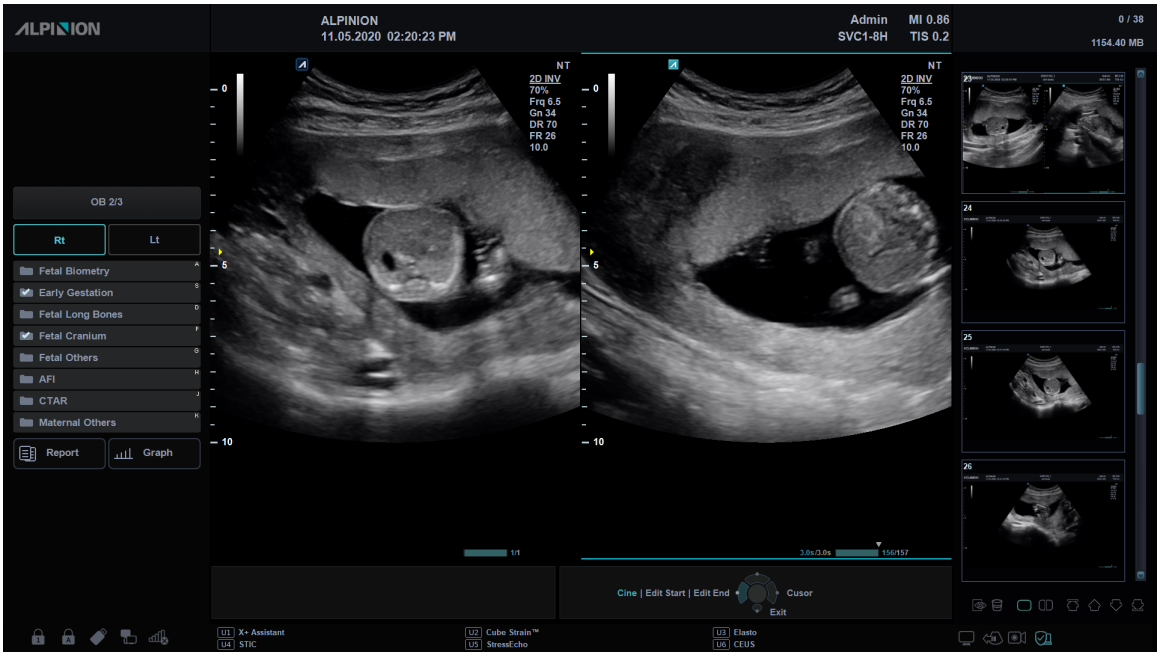


Figure 10-11 X+ Compare Display

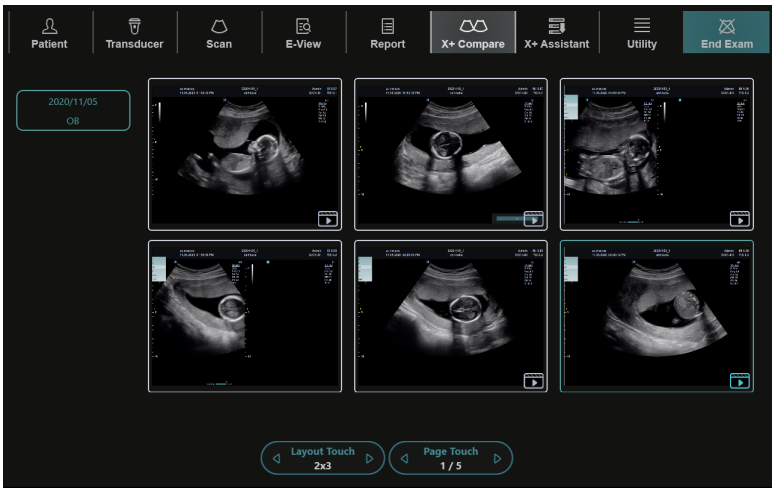


Figure 10-12 X+ Compare Touch Screen

To compare the archived images to a live image,

1. Select the patient on the Patient Browser page.
2. Select **ImageView** on the touch screen, or select **ImageView** on the menu selection. Image View page appears.
3. Select which specific image you would like to compare to the current image.
4. Select **X+ Compare** on the touch screen.
5. The selected image is shown in the right of the screen, and the live image is shown in the opposite side.
6. Start scan and press the **[Freeze]** key to freeze the image at the same position to make a comparison.

Image History

Image History allows you to review all previous studies for the selected patient. When you access Image History, the study information with the study date and location appears in a table.

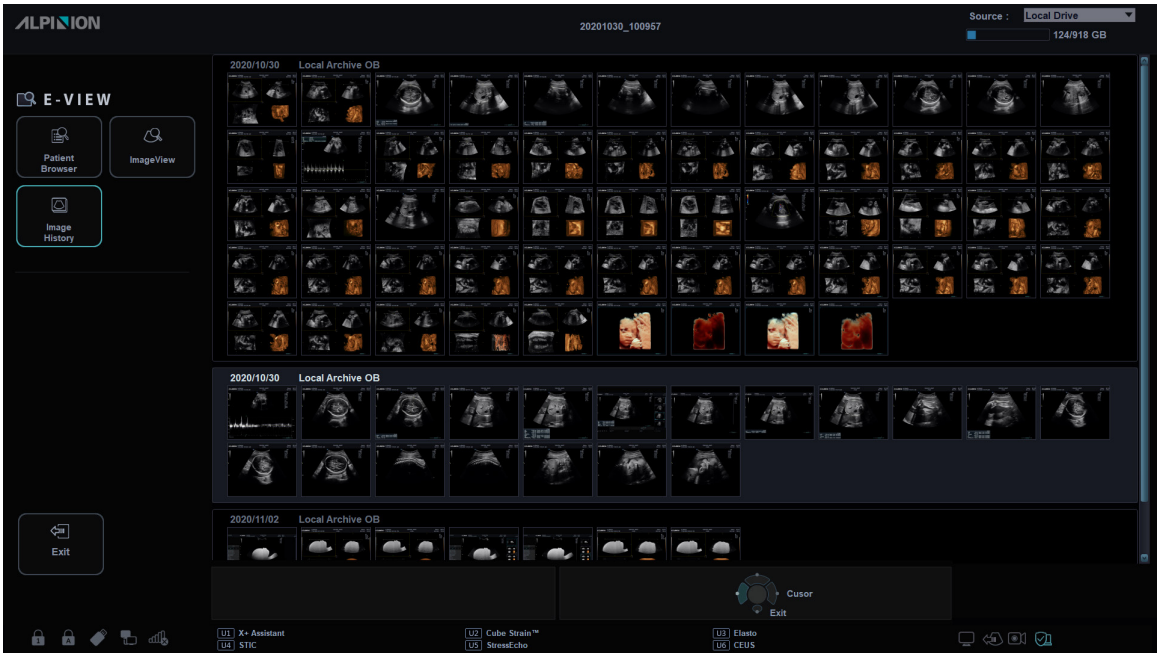


Figure 10-13 Image History Display

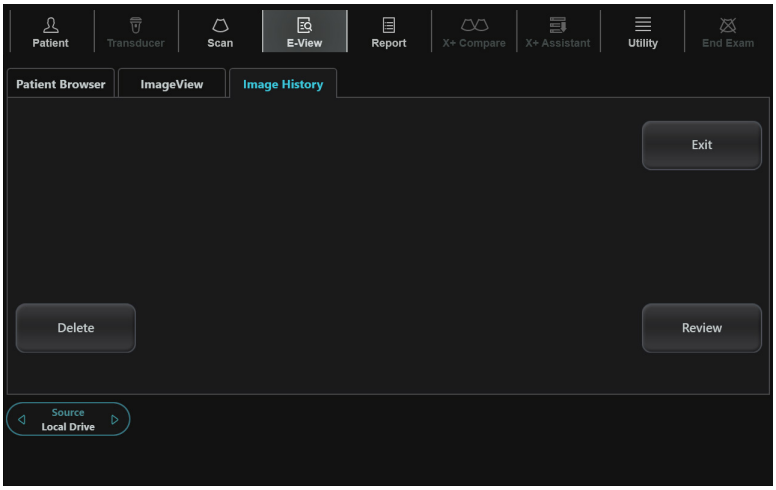


Figure 10-14 Image History Touch Screen

To activate and exit Image History,

1. Insert a media that contains patient data, if necessary.
2. Select a source from the ***Source*** drop-down list.
3. To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.
4. Select a desired patient from the patient list.
5. Select **Image History** on the touch screen, or select **Image History** on the menu selection.
   All of the studies for the selected patient are listed by chronological order.
6. Select an image in the desired study by using **[Trackball]**. The blue-colored frame appears on the selected image.
   To review multiple images between different studies, select desired images of the studies you want. You can select up to four images at one time.

   NOTE

   You can compare images by changing the image layout to dual imaging or quad imaging. Press the **[Dual]** key or **[Quad]** key on the control panel.
7. Select **Review** on the touch screen to review the image.
8. To delete the image, select **Delete** on the touch screen.
9. When you have finished, press the **[2D]** key to return to the scan mode.

Ending a study

To end a study immediately,

- Touch **End Exam** on the touch screen.
- Press the **[End Exam]** key on the QWERTY keyboard.

DICOM Spooler

The DICOM spooler displays the current DICOM output jobs. It is used for checking the current job's status when a job is saved status.

To start the DICOM spooler,

– Press the **[DICOM Spooler]** on the QWERTY keyboard.
  The ***DICOM spooler*** window is displayed.

To exit the DICOM spooler,

– Click **Exit**.

– Press the **Exit** key on user-defined key.

DICOM Spooler Window

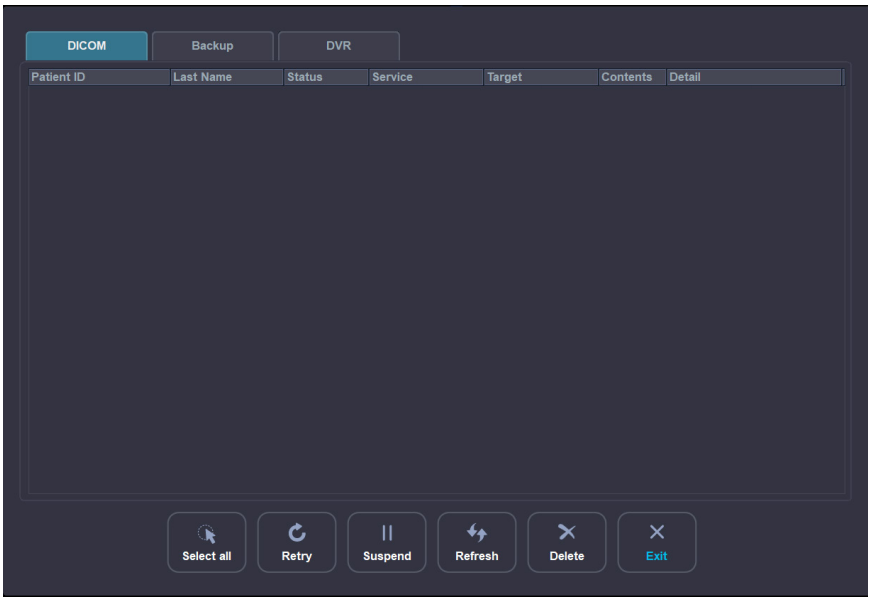


Figure 10-15 DICOM Spooler Window

The following job status can be displayed on the ***DICOM spooler*** window.

Table 10-4 DICOM job status

Job status	Description
Hold	Job process is on hold.
Pending	Job is currently sending and the system is waiting for the server's response.
Active	Job is in progress.
Failed	Job is failed to send.
Done	Job is sent successfully.

NOTE

When your system is connected to an MPPS* service, the following job status is available: In progress, Completed.

*Modality Performed Procedure Step (MPPS) is a DICOM service that enables you to notify the status information of a study to PACS.

Spooler Options

On the ***DICOM spooler*** window, you can use the following options:

Option	Description
Select All	Select all jobs in the DICOM spooler.
Retry	Retry sending the selected job.
Delete	Quit the selected job.
Suspend	Suspend the selected job.
Refresh	Refresh the spooler. The completed jobs are deleted from the spooler.
Cancel	Exit the DICOM spooler.

To delete a job,

1 Select the job(s) to delete in the ***DICOM spooler*** window.

NOTE

Only jobs that failed or are in hold can be resent.

2 Click **Delete**.

To resend a job,

1 Select the job(s) to re-send in the ***DICOM spooler*** window.

2 Click **Retry**.

To hold a job,

1 Select the job(s) to hold in the ***DICOM spooler*** window.

NOTE

Only inactive jobs can be set on hold.

2 Click **Suspend**.

3 To undo hold, click **Retry**.

Printer

Connecting to a Printer via USB Connection

1. When the system power is off, connect a USB cable of the printer to the USB port at the rear of the system and turn the printer power on.
2. Press the **[Power On/Off]** key on the control panel.

   NOTE
   Do not disconnect the USB cable when the system power is on.
3. If necessary, install the printer driver.

   NOTE
   Only recommended printer drivers are installed as default. Refer to your printer manual for installation.
4. Go to **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral** to set the printer as a default printer.
5. Select **Add Printers...** to add a new printer driver via USB serial port.

   CAUTION
   When you select select the **Cleanup Printer Jobs in Queue When System Bootup** check box, all jobs in queue will be deleted whenever system reboots.
6. To assign a printer to one of the print keys, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
7. Select the appropriate print key (**P1**, **P2**, **P3**, **P4**).
8. From the printer list under **Standard Printer**, select a printer to be assigned on the print key and click **>>** to add the printer device.
9. Select the printer from the ***Available Printer*** list and click **>>** to move it to the ***Selected Printer*** list.
10. Click **Save & Exit** to save the changes and return to the scan screen.

Setting up the Printer to Print Reports

To set up the printer to print reports,

1. Go to **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral**.
2. If necessary, select **Add Printers...** to add a new printer driver via USB serial port.
3. Select the printer from the ***Default Printer*** drop-down list.
4. Click **Save & Exit** to save the changes.
5. Press the print key on the control panel to print the report.

   NOTE
   The print key is programmable. To assign the print keys for printing the report, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.

DVR (Digital Video Recorder)

Setting up the DVR

To set up the DVR,

1. Make sure that a DVR is connected to the system when the system power is off.
2. Set up following parameters in **Utility** > **Setup** > **SystemPreset** > **System** > **Peripheral** > **VCR**.
   - **VCR**: VCR/DVR, USB storage
   - **VCR Format**: NTSC or PAL, MPEG or AVI
   - **VCR Maximum Time (min.)**: 1 to 20 (Only available for USB.)
3. If necessary, assign the DVR function to user-defined key in **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key**.
4. If necessary, assign the Rec/Pause function to user-defined key in **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
5. When you have finished, click **Save & Exit** to save the changes.

DVR Touch Screen and Controls

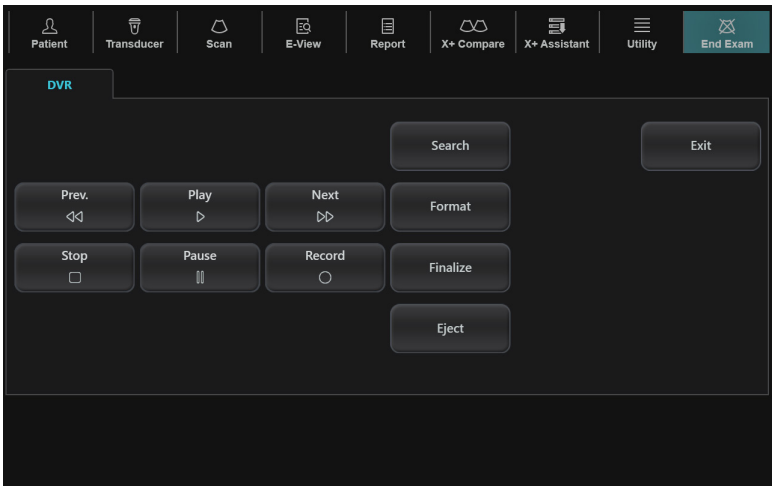


Figure 10-16 DVR Touch Screen

Table 10-5 DVR controls

Parameter	Description
Prev.	Skip to the previous chapter.
Next	Skip to the next chapter.
Play	Play a video from DVD or USB storage device.
Stop	Stop playback or recording.
Pause	Pause recording and playback.

Parameter	Description
Record	Start recording.
Search	Start the Search. The Search dialog appears.
Format	Delete all the record in the DVD+RW/-RW.
Finalize	Finalize a DVD-R.
Eject	Eject the DVD media/USB storage device.

Using the DVR

NOTE

Before recording, make sure that the DVR power is on and the media is played in the tray.

To record an image,

1. Select **Patient** on the touch screen.
   The ***Patient*** screen appears.
2. Create a new patient record or or open an existing one.
3. Insert a DVD media or USB storage device.
4. Touch **Utility** on the touch screen.
5. Touch **DVR** on the touch screen.
   The DVR menu appears on the touch screen.
6. Select **Record** on the touch screen to start recording.
   The DVR status icon ( ) turns light blue.
7. Select **Pause** or **Record** to pause/resume recording.
8. Select **Stop** on the touch screen to stop recording.
9. When you have finished, select **Finalize** to finalize a DVD-R.
10. Select **Eject** on the touch screen to eject. Or press the **[Eject]** key on the QWERTY keyboard.
11. Select **Exit** to return to scanning.

DVR Spooler

The DVR spooler displays the current recording jobs. You can control or monitor recording jobs. From the DVR spooler, you can retry, delete, or redirect job.

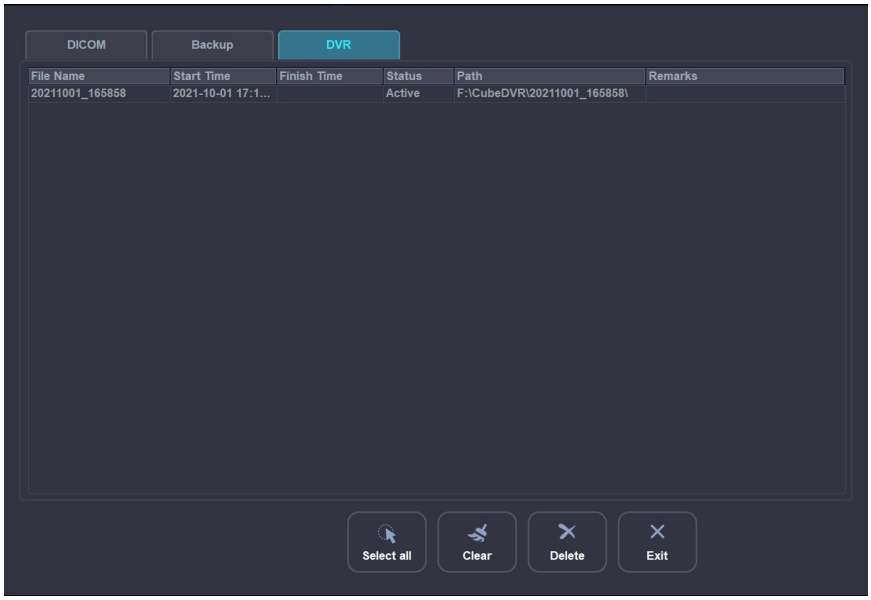


Figure 10-17 DVR Spooler Window

To start the DVR spooler,

1. Press the **[DICOM Spooler]** on the QWERTY keyboard.
   The ***DICOM spooler*** window is displayed.
2. Select the **DVR** tab.

To exit the DVR spooler,

– Click **Exit**.

– Press the **Exit** key on user-defined key.

11

Diagnostic Features

This chapter describes the information about diagnostic features of the system.

X+ Compare

X+ Compare allows you to perform serial scans on a patient when you can compare the images from a patient's previous exam(s) to the patient's current exam.

X+ Compare Display

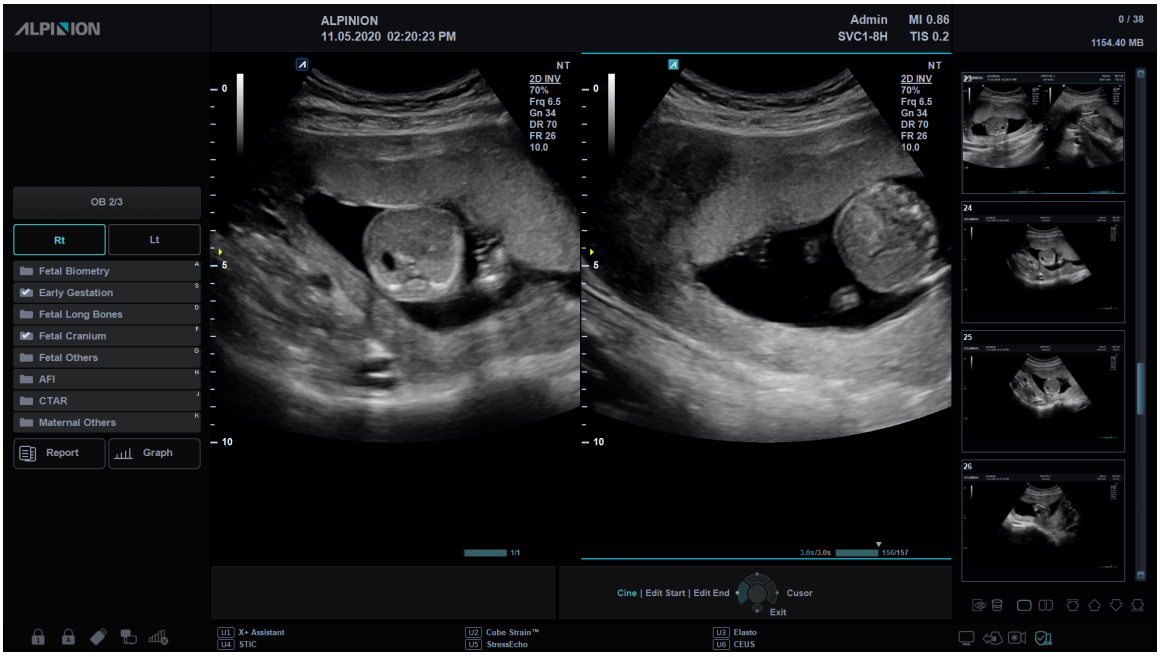


Figure 11-1 X+ Compare Display

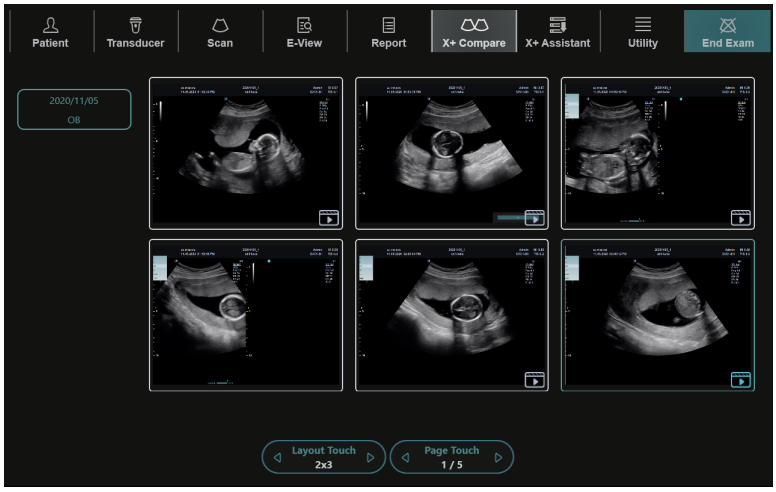


Figure 11-2 X+ Compare Touch Screen

General Workflow

To compare the archived images to a live image,

1. Touch **X+ Compare** on the touch screen.
   The patient's exam lists and images appear on the touch screen.
2. Select the desired comparison image on the touch screen.
3. The selected image is shown in the right of the screen, and the live image is shown in the opposite side.
4. Start scan and press the **[Freeze]** key to freeze the image at the same position to make a comparison.
5. To save the images, press the **[P1]** key (or the assigned print key) on the control panel.

   NOTE

   To assign the print keys for saving an image or volume data, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
6. When you have finished, press the **[2D]** key to exit from Dual Comparison Display mode.

X+ Assistant

X+ Assistant provides an automated exam script that moves you through an exam step-by-step. This allows you to focus on performing the exam rather than on controlling the system and can help you to increase consistency while reducing keystrokes.

The system automatically invokes the correct mode and imaging parameters, advances to the next step in an exam, annotates the image, initiates measurements, and assigns the measurements to the worksheet/report.

X+ Assistant Manager

The X+ Assistant Manager is used to import or export protocols created via the X+ Assistant Editor and to add or assign protocols to an exam category.

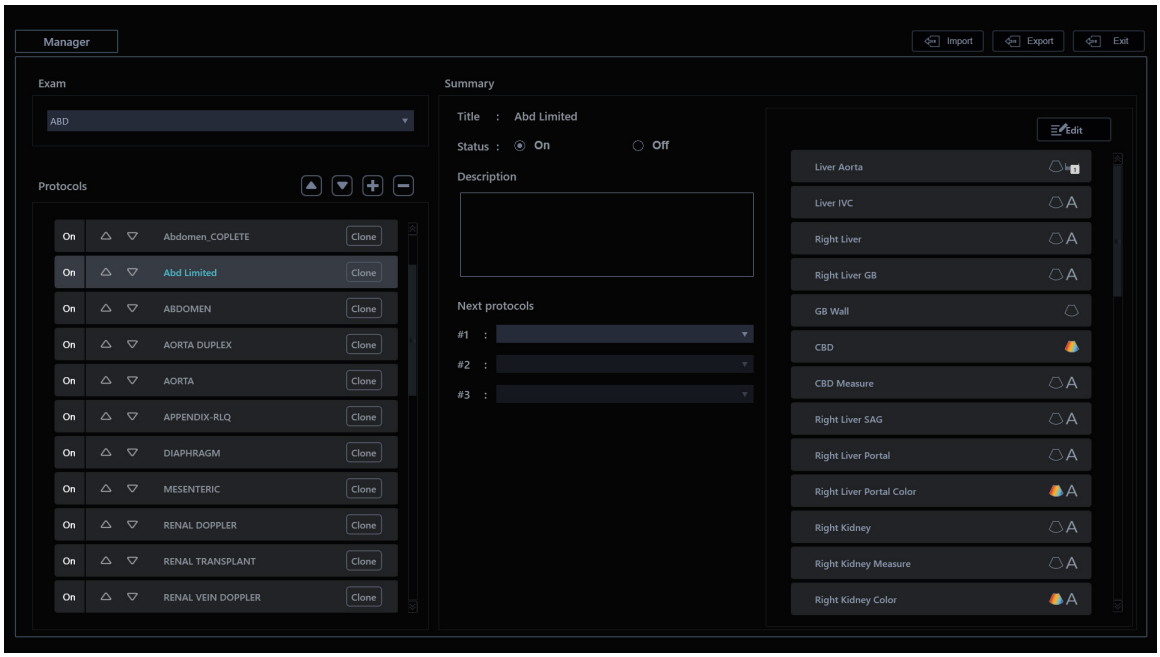


Figure 11-3 X+ Assistant Manager

Table 11-1 X+ Assistant Manager

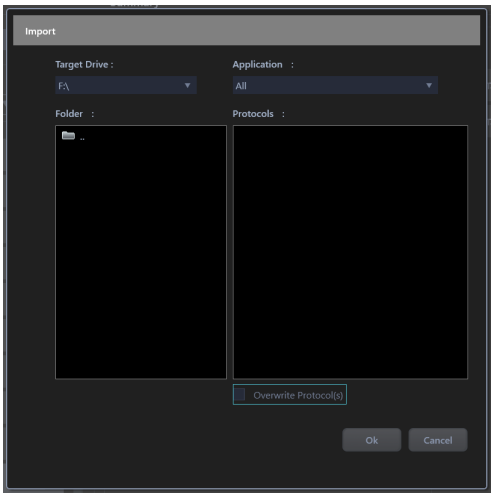
Function	Description
Exam	A list of available applications is shown. Selection of ABD, CARD, GYN, MSK, OB, PED, SMP, TCD, URO, or VAS is available.
Protocols	Provides a protocol list for the application.
Create	Create a new protocol.
Move Up (▲)	Move the protocol selected from the protocol list up one row.
Move Down (▼)	Move the protocol selected from the protocol list down one row.
Add (✚)	Create a new protocol on the row below the protocol selected from the protocol list.

Function	Description
Delete (—)	Delete a protocol selected from the protocol list.
Summary	The title of the protocol, Status, Description
Next Protocols	Select the next protocols performed after complete the selected protocol.
Task List	Provide a task list which belongs to the protocol selected from the protocol list.
Edit	Edit a protocol.
Import	Import the protocol data.
Export	Export the protocol selected from the protocol list.
Exit	Use to save all changes and exit the X+ Assistant Manager page.

Importing the protocol data

To import the protocol data,

1. Insert the media with the saved protocols from the X+ Assistant Creator or exported protocols from another system.
2. Touch **X+ Assistant** on the touch screen**.**
   The X+ Assistant Manager page appears.
3. Click **Import**. The ***Import*** dialog box appears.

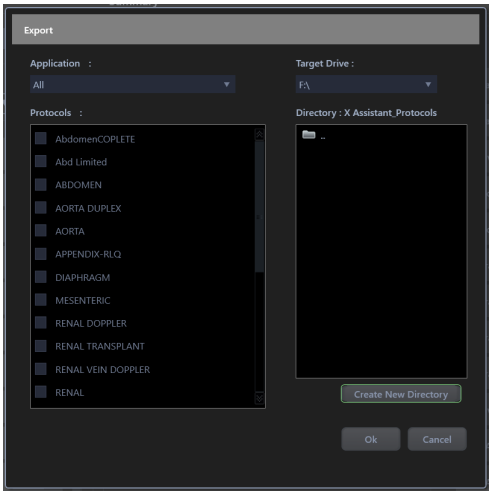


4. Select the media that the protocol is stored on from the ***Target Device*** drop-down list.
5. Select the protocol folder from the ***Folder*** list.
   If a folder is selected, all programs in the folder are displayed in the ***Protocols*** field.
6. Select the protocol(s) to be imported.
7. If you want to overwrite the existing protocol(s), select the **Overwrite Protocol(s)** check box.
8. Click **OK**. The protocol(s) you selected are stored to the system.
   You can see the protocol(s) on the ***Protocols*** list on the X+ Assistant Manager page.

Exporting the protocol data

To export the protocol data,

1. Insert the media to save the protocol data to.
2. Touch **X+ Assistant** on the touch screen**.**
   The X+ Assistant Manager page appears.
3. Click **Export**. The ***Export*** dialog box appears.



4. Select the media that the protocol is stored on from the ***Target Device*** drop-down list.
5. Select the Protocol Directory if the desired Protocol Directory already exists on the media.
   If not, or if you want to export the protocol to a new Protocol Directory, click **Create New Directory** and type a new Protocol Directory name in the field.
6. Select the protocol(s) to be exported from the ***Protocols*** list.
7. Click **OK**. The protocol(s) you selected are stored to the media.
   You can export it to another system.

X+ Assistant Editor

The X+ Assistant Editor is used to build customized protocols that can be imported onto the X-CUBE 70. These protocols automate many of the steps normally performed manually by the user, thereby reducing the number of user actions and the amount of time to perform an exam.

To access the X+ Assistant Editor,

1. Touch **X+ Assistant** on the touch screen. The X+ Assistant Manager page appears.
2. Select **Edit** on the X+ Assistant Manager page or touch **Editor** tab on the touch screen.

Figure 11-4 X+ Assistant Editor

Table 11-2 X+ Assistant Editor

Function	Description
Task List	Provide a task list which belongs to the protocol.
Create	Add a task on the last row.
Move Up (▲)	Move a task selected from the task list up one row.
Move Down (▼)	Move a task selected from the task list down one row.
Add (✚)	Add a new task on the row below the task selected from the task list.
Delete (—)	Delete a task selected from the task list.
Task Parameter	Provide the task parameters which belong to the protocol selected from the protocol list.
Apply	Save changes after add/update task parameters.
New	Add a task on the last row.
Clone	Copy a task selected from the task list.

Function	Description
Remove	Delete a task selected from the task list.
Undo	Undo the last performed function.
Task Parameter	Provide a parameter which belongs to the protocol selected from the protocol list.
Return	Exit the X+ Assistant Editor page and return to the X+ Assistant Manager page.

Creating new protocols

To create a new protocol,

1. Click **Create** under the ***Protocols*** field. Or click Add icon (✚).
   The system adds a new protocol with a name such as Protocol #.
2. Use **[Trackball]** to move the cursor on the new protocol name, the protocol name is automatically highlighted. Type a name for the new protocol.
3. Add your settings for the protocol: Status, Description, Next Protocols.
4. When you have finished, click **Edit** to add tasks.
   The X+ Assistant Editor page appears.
5. Click **Create**. The task name is shown on the left and the task parameters appear on the right.
6. The system adds a new task with a name such as Task #. Type a name for the new task in the ***Title*** field.
7. Set task parameters for the task. The task parameters are separated into four groupings: Imaging, Comment, Body Pattern, Measurement.
8. When you have finished, select the task to highlight it.
9. Click **Clone** to copy a selected task.
10. Edit the task parameters for the copied task.
11. If necessary, click Move Up/Move Down icon (▲/▼) to move a task selected from the task list up/down one row.
12. Repeat the same procedure to add more tasks to the protocol.
13. When you have finished, click **Return** to exit the X+ Assistant Editor page.

Editing protocols

When editing protocols, you can add, copy, insert, move, delete the tasks. Also, you can modify the task parameters for corresponding tasks.

Editing tasks

You can insert, move up and down, and delete tasks. To move up and down the task, one or more consecutive steps must be selected.

To add a new task on the last row of the protocol,

- Select the last task of the protocol and click the Add icon (✚).
- Click **Create**.
- Click **New**.

To add a new task on the row below the task selected from the task list,

- Select the task of the protocol and click the Add icon (✚).

To copy a task of the protocol,

- Select the task of the protocol and click **Clone**.

To delete a task of the protocol,

- Select the task of the protocol and click the Delete icon (—).
- Select the task of the protocol and click **Remove**.

Editing task parameters

To add/update a parameter to edit task parameters,

- Select the value from a list.
- Select or clear a check box.

Task parameters

In the X+ Assistant Editor, the users can program the tasks in an exam and specific parameters for each task. All parameter names and descriptions are listed in the following table.

Imaging mode parameter

Parameter	Description
Mode: CF, M, PW, CW, PDI, Live Dual, Panoramic, CEUS, 3D	• **On**: When selected, the mode is on. • **Off**: When not selected, the mode is off.
Dual	• **Default**: Dual screen is not in use. • **Off**: Dual screen is off. • **On**: Dual screen is on.
Quad	• **Defau**lt: Quad screen is not in use. • **Off**: Quad screen is off. • **On**: Quad screen is on
HAR/INV	• **On**: When selected, Harmonic is on. • **Off**: When not selected, the Harmonic is off. • **Default**: Not specified so X+ Assistant does not set this parameter.
Depth(mm)	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Value: 1 cm • Max Value: 40 cm
Spatial Compounding	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Index: 0 • Max Index: 3
Color Baseline	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Index: -100 • Max Index: 100
Color/PW Steer	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Index: -20 • Max Index: 20
Simultaneous	• **Default**: Not specified so X+ Assistant does not set this parameter. • **Off**: Simultaneous is off. • **On**: Simultaneous is on.
Virtual	• **Default**: Not specified so X+ Assistant does not set this parameter. • **Off**: Virtual is off. • **On**: Virtual is on.
Full SRI	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Index: 0 • Max Index: 5
SV Size	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Value: 0.5 mm • Max Value: 11.0 mm

PW Baseline	• **Default**: Not specified so X+ Assistant does not set this parameter. • Min Index: -8 • Max Index: 8
CEUS Timer	• **Default**: Not specified so X+ Assistant does not set this parameter. • **Off**: CEUS Timer is off. • **On**: CEUS Timer is on.

Comment parameter

Parameter	Description
Location	Choose where the comment is located on the image area. • **Left Top** • **Right Top** • **Left Bottom** • **Right Bottom**
Color	Select a font color for the comment. • **White** • **Yellow** • **Green** • **Orange**
Size	Select a font size. • Index 1-10

Body Pattern parameter

Parameter	Description
Location	Choose where the body pattern graphic is located on the image area. • **Left Top** • **Right Top** • **Left Bottom** • **Right Bottom**
Select	Used to enable the ***Body Pattern*** dialog box so that the Body Pattern graphic can be selected and the position of the transducer marker can be set.
Clear	Delete Body Pattern and Location defined for the step.
Available Items	Select the desired body pattern.
Pictogram	The selected body pattern graphic is displayed.
Probe Size	Select the size of transducer marker. • **Small** • **Medium** • **Large**
Close	Use to save the changes and exit the ***Body Pattern*** dialog box.
Show a probe protractor	Select the check box to change the angle of transducer marker. The each level of the angle increment/decrement is 45 degrees.

Measurement parameter

Parameter	Description
Application	• Abdominal • Breast • Cardiac • Emergency Medicine • Gynecology • MSK • Obstetrics • Pediatrics • Small Parts • Urology • Vascular
Fetus	When selected, the fetus measurement qualifier is set to: • A: Fetus A • B: Fetus B • C: Fetus C • D: Fetus D • Default: Not specified so X+ Assistant does not set this parameter.
Side	When selected, the side measurement qualifier is set to: • Rt: Right side of the body • Lt: Left side of the body • None: Not used (neither Right nor Left) • Default: Not specified so X+ Assistant does not set this parameter.
Location	When selected, the location measurement qualifier is set to: • Default: Not specified so X+ Assistant does not set this parameter.
Measurement Items #1-3	Specify the measurement package to be used for the X+ Assistant. (User-defined measurements are not available.)

Using X+ Assistant

After you have set up X+ Assistant, the protocol is active when you exit the ***Patient*** screen. The protocol is located on the left-hand side of the display and as you can see in the example below, the annotation for the first step has been automatically noted on the image, ready for you to scan the specified anatomy.

X+ Assistant display discription

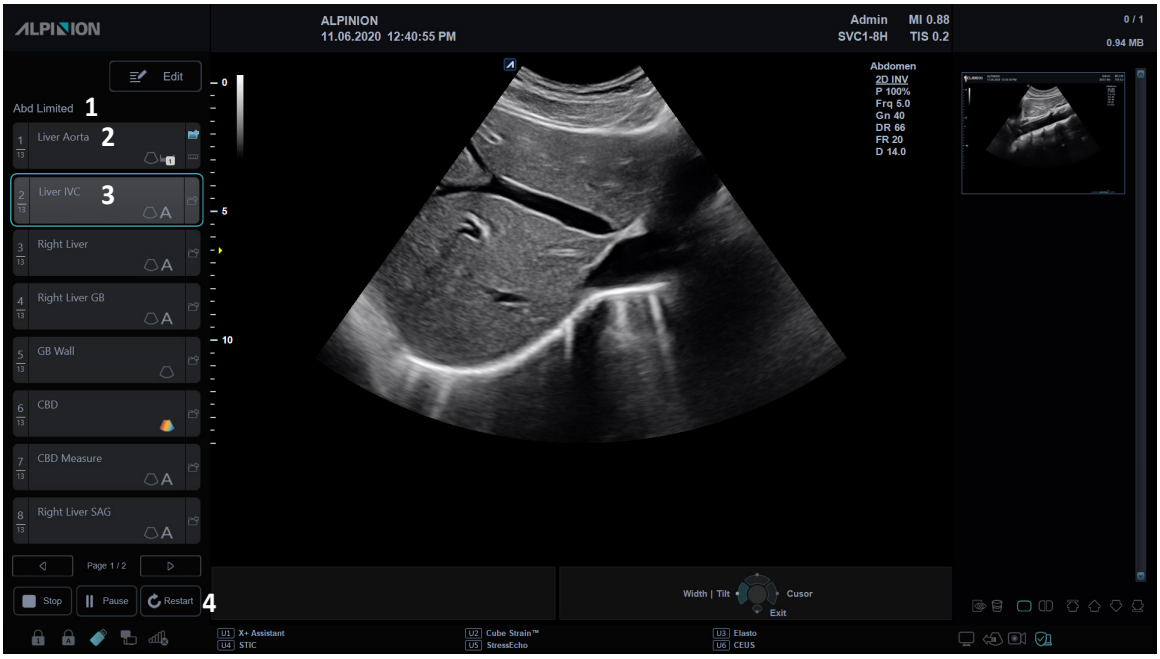


Figure 11-5 X+ Assistant Display

1	Protocol name	**3**	Active step
2	Protocol step status, step number, step name	**4**	Navigation: Stop, Pause, Restart

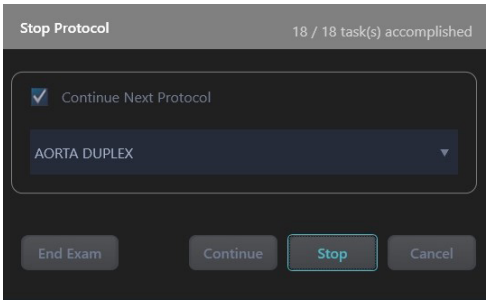
Starting an Exam with X+ Assistant

To perform an exam with X+ Assistant,

1. Touch **Patient** on the touch screen. The ***Patient*** screen appears.
2. Register the patient or the new exam.
3. Select the **X+ Assistant** checkbox.
4. Select the desired protocol from the protocol list.
5. Select **Start Exam** on the touch screen to start the exam.
   The scan screen with X+ Assistant protocol appears.
6. Follow the tasks indicated in the X+ Assistant protocol; acquire images or perform measurements and press the **[P1]** key (or the assigned print key) on the control panel to move to the next task in the X+ Assistant protocol.

7 To pause or unpause X+ Assistant, click **Pause** at the bottom of the X+ Assistant protocol.

8 To stop or restart a protocol, click **Stop** at the bottom of the X+ Assistant protocol. A ***Stop Protocol*** dialog box appears.



- **Continue Next Protocol**: Select the checkbox to perform the exam with the selected protocol from the below protocol drop-down list.
- **End Exam**: End the current exam immediately and save all images in the local hard disk.
- **Continue**: Perform the exam with next protocol.
- **Stop**: Stop the exam with the current protocol.
- **Cancel**: Restart the exam with the current protocol.

9 To skip a task or move to a certain task, select the task you want to move to using **[Trackball]** and the **[Set]** key.

10 When the protocol is completed, a ***Stop Protocol*** dialog box appears.

11 Click **Stop**.

Panoramic Imaging

The panoramic imaging feature extends your field of view by piecing together multiple 2D images into a single, extended 2D image. For using this feature, you need an additional request to your local agent.

After you acquire the extended image, you can rotate it, move it linearly, magnify it, add comments or body patterns, or perform measurements on the extended image.

You can perform the panoramic imaging feature on 2D images with linear and convex transducers.

CAUTION

The panoramic imaging constructs an extended image from individual image frames. The quality of the resulting image is user-dependent and requires some additional skill and practice to develop proper technique and become fully proficient. To avoid technique-related artifacts and measurement inaccuracies, read this entire chapter before using the panoramic imaging feature.

Transducer Compatibility

The panoramic imaging is available on Convex and Linear transducers. The transducers that support the panoramic imaging are as follows:

- Convex: SC1-7H, SC2-9H
- Volume Convex: SVC1-8H
- Linear: L3-12X, L10-25H, SL3-19H, SL3-19X, L3-8H, L3-15H

General Workflow

To perform the panoramic imaging,

1. Connect the appropriate compatible transducer.
2. Apply the enough ultrasound gel along the entire area to be scanned.
3. Place the transducer on the desired scan area.
4. Obtain a 2D image and optimize the image for the best quality.
5. Select **Panoramic** on the touch screen to enter the acquisition preparation status.
6. Select **Start/Stop** on the touch screen or press the **[Set]** key on the control panel to start the image acquisition.
7. Select **Start/Stop** on the touch screen again or press the **[Freeze]** key on the control panel to stop the image acquisition.
8. When you completed the image acquisition, you can perform operations such as adjusting image parameters or zooming in or out the panoramic image.
9. Select **Exit** on the touch screen to exit the panoramic imaging mode and return to 2D mode.

Panoramic imaging Display

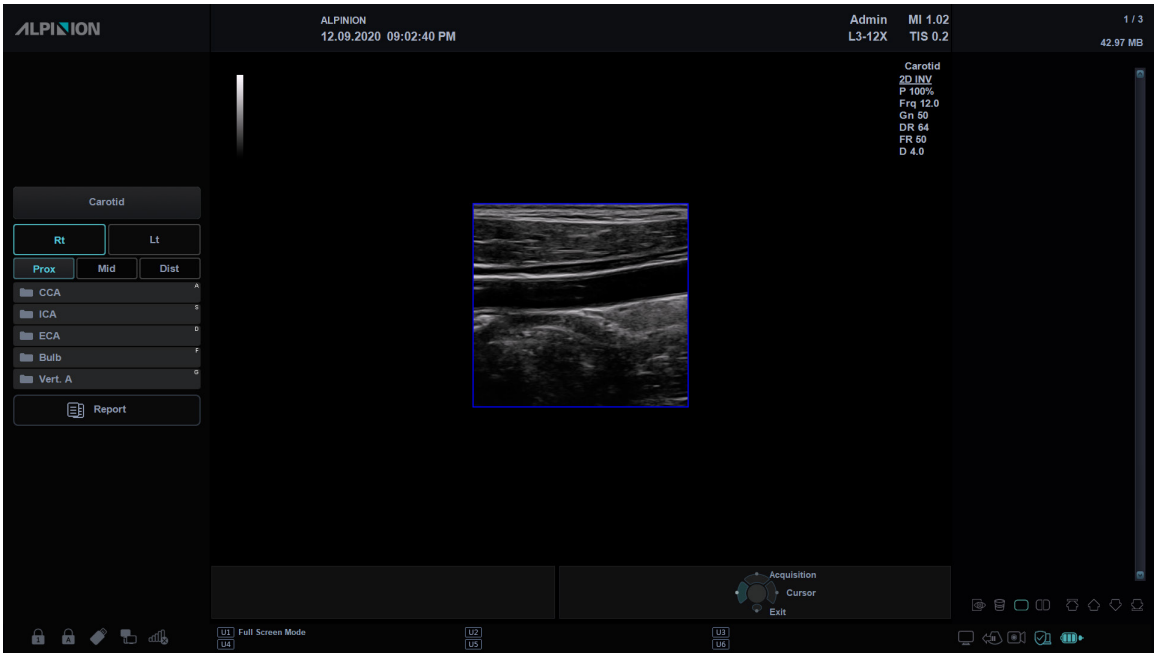


Figure 11-6 Image Acquisition Preparation Status

Figure 11-7 Panoramic Image Acquisition

Panoramic Imaging Controls

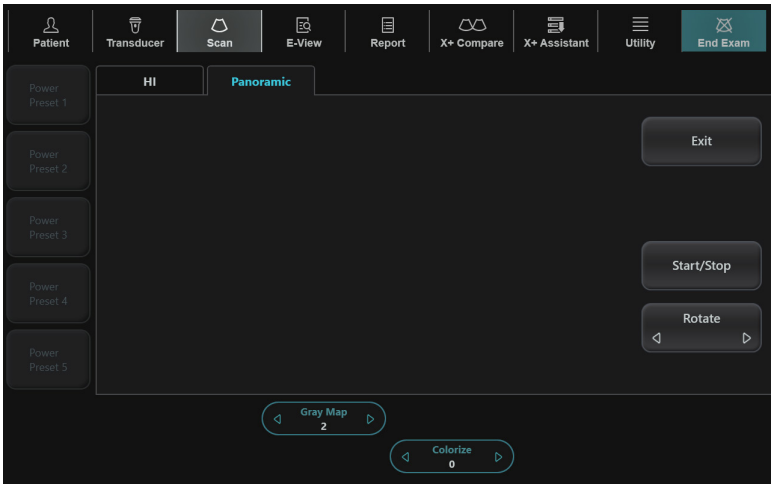


Figure 11-8 Panoramic Imaging Touch Screen

The following table describes the panoramic imaging controls.

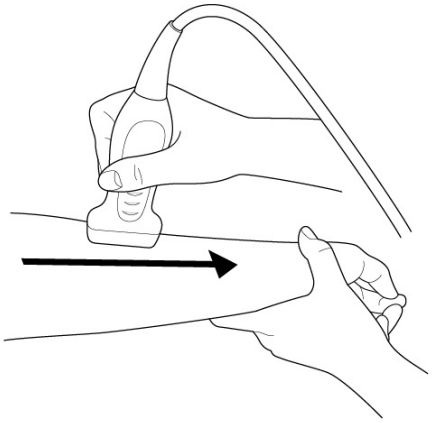
Parameter	Description
Start/Stop	Start or stop the image capture.
Gray Map	Change the gray map.
Colorize	Colorize the 2D image.
Rotation	Rotate the image for the convenience of viewing the image.
Exit	Exit the panoramic imaging mode and return to 2D mode.

Acquiring the Panoramic Image

To create a panoramic image, you need to obtain a 2D image and optimize the image.

To acquire a panoramic image,

1. Select **Panoramic** on the touch screen.
   You can access the Panoramic setup mode, and the blue-colored ROI appears.
2. Press the **[Set]** key to start the image acquisition.
3. Move the transducer linearly along the scan path.



NOTE

To acquire an optimal image, move the transducer slowly and steadily.

4. If you restart the image acquisition, press the **[Set]** key again.
   You can access the Panoramic setup mode, and the blue-colored ROI appears.
5. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
   The panoramic image is displayed.

TIPS

For even movement,

- Make sure there is enough ultrasound gel along the scan path.
- Always move the transducer slowly and steadily.
- Do not lift the transducer from the skin surface during the scan.
- Always keep the transducer perpendicular to the skin surface. Do not rotate or tilt the transducer during the scan.
- Keep the motion within the same scan plane, if possible. Do not slide the transducer laterally.
- Deeper scans generally require reduced speed.

Viewing the Panoramic Image

After completing the image acquisition, you can perform the following functions:

- Image optimization
- Image zooming
- Image rotation
- Measurement
- Annotation: Comment, Body Pattern

Optimizing the image

To optimize the image, you can adjust the following parameters:

- **Gray Map**

  Rotate the **Gray Map** soft key to change the gray map of the 2D image.

- **Colorize**

  Rotate the **Colorize** soft key to change the color of the 2D image.

Zooming in/out the image

To zoom in the image,

– Rotate the **[Zoom]** key clockwise. And use **[Trackball]** to change the position of the magnified image.

To zoom out the image,

– Rotate the **[Zoom]** key counter-clockwise.

Rotating the image

To rotate the image,

– Select **<** or **>** of **Rotation** on the touch screen.

Performing a measurement

To perform a measurement,

– Press the **[Caliper]** key on the control panel.

NOTE

2D measurement package is available.

Annotating the panoramic image

To annotate the panoramic image,

1. Press the **[Text]** key on the control panel to activate the annotation function.
   The comment library appears on the touch screen.
2. Select the desired comment on the touch screen, or type the desired comment using the QWERTY keyboard.
3. To activate Body Pattern, press the **[Body Pattern]** key on the control panel.
   A list of body patterns appears on the touch screen.
4. Select the desired body pattern on the touch screen.
   The body pattern with a transducer marker is shown on the screen.

Saving the Panoramic Image

To save the panoramic image,

– Press the **[P1]** key (or the assigned print key) to save the image.

Exiting Panoramic Imaging

To exit the panoramic imaging mode,

– Select **Exit** on the touch screen or press the **[2D]** key on the control panel.

Needle Vision™ Plus

Needle Vision™ Plus uses integrated Beam Steering technology for increased needle visualization with maintaining excellent image quality and enhancing the needle brightness. With the needle enhancement feature, you can see the needle more easily during clinical procedure.

NOTE

Needle Vision™ Plus is an optional feature. For using this feature, you need an additional request to your local agent.

Transducer Compatibility

Needle Vision™ Plus is available on Linear transducers. The transducers that support Needle Vision™ Plus are as follows:

- Linear: L3-12X, L10-25H, SL3-19H, SL3-19X, L3-8H, L3-15H

Needle Vision™ Plus Display

Figure 11-9 Needle Vision™ Plus Screen

Needle Vision™ Plus Controls

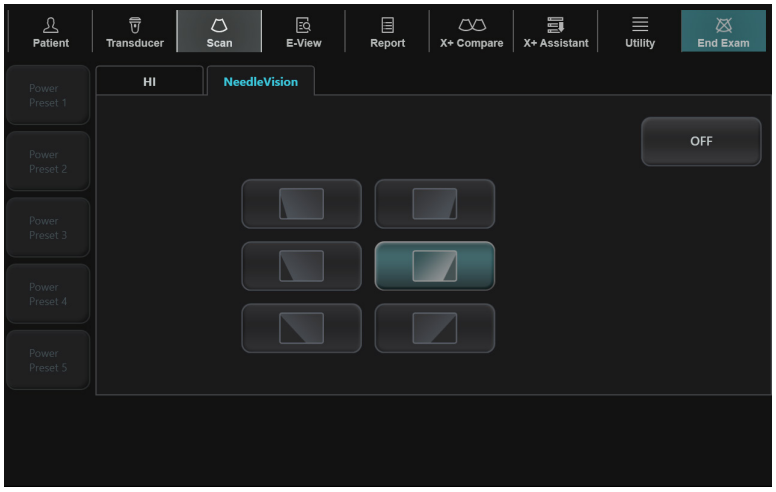


Figure 11-10 Needle Vision™ Plus Touch Screen

The following table describes the Needle Vision™ Plus controls.

Parameter	Description
L/R Flip	Flip the direction of beam steering horizontally.
Angle	Change the beem angle.
OFF	Exit Needle Visions™ Plus.

General Workflow

To activate Needle Vision™ Plus,

1 Select **NeedleVision** on the touch screen.

NOTE

You can use user-defined key to activate Needle Vision™ Plus. To assign the Needle Vision™ Plus function to user-defined key, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **Needle Vision™**.

2 If necessary, optimize the image by use the following options:

- **L/R Flip (Left/Right)**: Select the left or right flip icon on the touch screen to flip the direction of beam steering.
- **Angle (Shallow/Medium/Steep)**: Select the angle icon on the touch screen to change the angles.

3 To exit Needle Visions™ Plus, select **OFF** on the touch screen.

Contrast Enhanced Imaging (CEUS)

The contrast enhanced ultrasound imaging is used in conjunction with ultrasound contrast agents to enhance the imaging of blood flow and microcirculation. Blood containing the contrast agent stands out brightly against a dark background of normal tissue.

With the contrast enhanced ultrasound imaging, you can see the micro-circulation in tissue easily during clinical procedure. For using this feature, you need an additional request to your local agent.

WARNING

Only physicians or echo technicians who have received appropriate training should perform Contrast Imaging.

CAUTION

- Cavitation may occur due to interactions between the ultrasonic waves and the contrast medium. Always perform examination using the ALARA (As Low As Reasonably Achievable) principle.
- Stop the examination and perform appropriate treatment, if there is any abnormality with the patient during use of the contrast medium.

NOTE

- Handle the contrast medium as described in the operation manual supplied with the contrast medium.
- Check the side effects of the contrast medium used with the manufacturer of the contrast medium.
- ALPINION MEDICAL SYSTEMS is not liable for any damage or injury resulting from improper use of contrast media.

Transducer Compatibility

The contrast enhanced ultrasound imaging is available on Convex transducer. The transducer that supports the contrast enhanced ultrasound imaging is as follows:

- Convex: SC1-7H

Abdominal Contrast Imaging

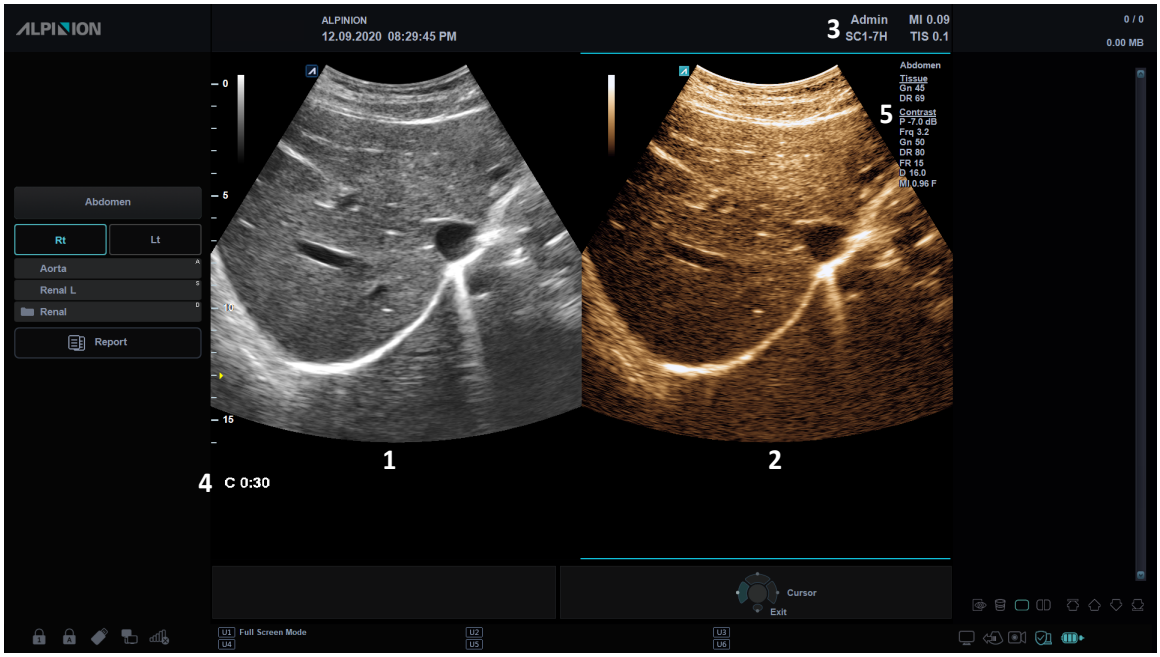


Figure 11-11 Abdominal Contrast Acquisition Display

1	2D imaging	**4**	Timer
2	Contrast imaging	**5**	2D image info / Contrast image info
3	MI and TI information		

Abdominal Contrast Controls

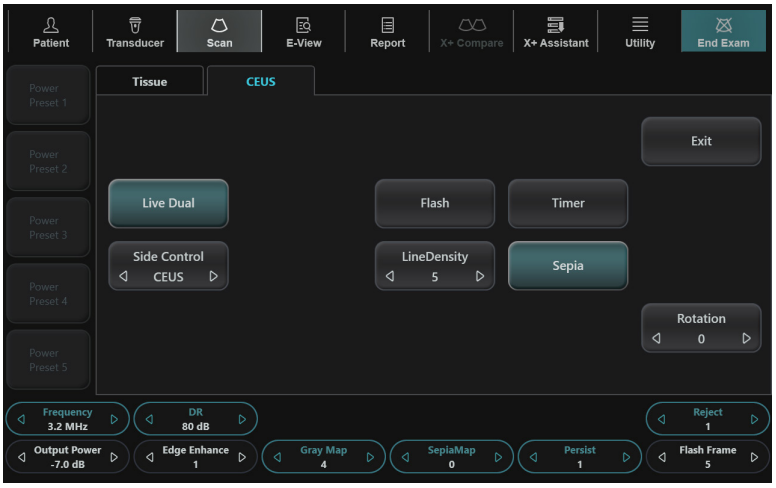


Figure 11-12 Abdominal Contrast Touch Screen

The touch screen displays various image controls which help you to optimize the Contrast mode image. The following table describes available controls on the touch screen.

Parameter	Description
Side Control	Select the desired view on the dual images (contrast image and the reference image).
Flash	Activate to expose the higher acoustic power for a specified time duration by pressing a control once. Flash is available in live imaging only.
Timer	Activate to start a clock which is used to record the time of microbubble contrast delivery. You can use it at the time of injection. Timer is available in live imaging only.
Output Power	Set the output power of the system for Contrast Imaging.
Flash Frame	Adjust the length of the Flash specified in number of frames.

NOTE

Some image optimizing controls are shared between Contrast and 2D mode.

General Workflow

To perform the contrast imaging,

1. Select **Contrast** on the touch screen.
   The contrast image and 2D image are displayed side-by-side.
2. Adjust the acoustic power experientially to obtain a good image.
3. Observe the tissue image to find the target view.
4. Inject the contrast agent, and select **Timer** on the touch screen to start the timing.
   When the timer begins to work, the time will be displayed on the screen.
5. Observe the image.
6. To save the images, press the print key on the control panel.

   NOTE

   The print key is programmable. To assign the print keys for saving an image or volume data, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
7. Perform several live captures if there are more than one sections of interest.
8. At the end of the contrast imaging, press the **[2D]** key to exit the contrast imaging.
9. Perform step 2–8 if necessary.

TIPS

- Optimize the 2D mode image as usual. Then select **Contrast** on the touch screen.
- Administer an amount of contrast agent advised by the contrast agent manufacturer for the targeted application.
- Use a low Output Power to minimize microbubble destruction.
- Remember to start the Timer when injecting contrast agent.

Time Intensity Curve (TIC) Analysis

Time Intensity Curve (TIC) enables the user to perform the following analysis:

- Time-Intensity analysis allows instant time-intensity calculation from up to eight regions of interest.
- Curve fitting analysis for research studies of contrast agent concentration rates.

The basic TIC workflow is as follows:

1. Scan the patient after injecting the contrast agent.
2. Observe the agent flow through the anatomy of interest.
3. When the desired contrast effect has been visualized, press the **[Freeze]** key to freeze the image.
4. Select a range of images for analysis.
5. Use **[Trackball]** to position an ROI (region of interest) on one of those images where the contrast effect is visible, and press the **[Set]** key.
6. The system then calculates the mean pixel intensity within that ROI for all frames in the user designated loop and plots the resulting data as a function of time.
7. If necessary, press the print key on the control panel to print TIC data.
   The system captures a single still frame onto the clipboard.

Activating TIC

To activate Time Intensity Curve (TIC),

1. Scan the patient in Contrast mode or select a desired cine loop from the stored images.
2. Press the **[Freeze]** key to freeze the image.
   TIC Analysis displays on the touch screen.
3. Select **TIC Analysis** on the touch screen.
   The ***TIC Analysis*** screen and the **TIC Analysis** tab display.

Reviewing Contrast Cine Loop

To review a contrast cine loop,

1. Open an examination and select a contrast cine loop from the clipboard.
2. Select **TIC Analysis** on the touch screen.

Exiting TIC Analysis

There are several methods to exit TIC Analysis.

– Press the **[Freeze]** key or **[2D]** key to return to the scan mode.

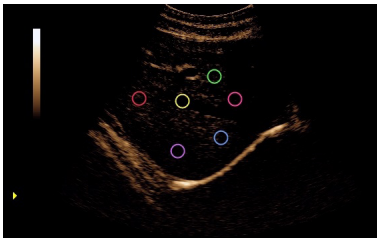
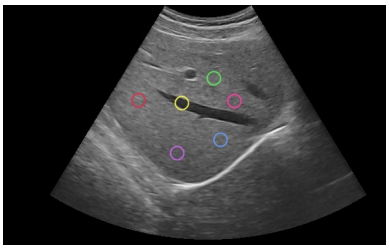
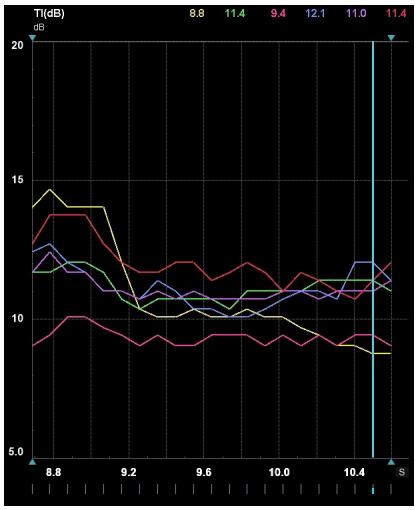
– Select **Exit** on the touch screen.

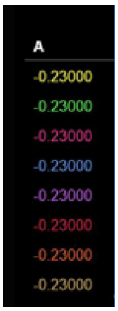
TIC Analysis Display

Figure 11-13 TIC Analysis display

1	Contrast cine loop window	**7**	Current frame marker
2	2D mode cine loop window	**8**	Sample area drawing tools
3	Sample area	**9**	Graph layout selection
4	Time and velocity at cursor position	**10**	Cine control tools
5	Frame marker	**11**	Trackball controls and status
6	Analysis window - TIC graph		

The following table describes the TIC Analysis display.

Display	Description
 **Contrast mode cine loop window**	Display Contrast cine loop with sample area.
 **2D mode cine window**	Display 2D mode cine loop with sample area.
 **Analysis window - TIC graph**	Display TIC graph. • X axis: Time(s), elapsed time from previous frame. • Y axis: Intensity scale(dB) or linear acoustic(AU). Press the **Y Unit** soft key. • Current frame: the current frame marker and the start and stop for the cine loop. • Display the time-intensity curve of up to eight sample areas. Each sample area display has a different color, and its corresponding trace data is plotted using that same color. • The time-intensity value of the Current frame is displayed at the top of the graph.
 **Frames**	Disable/Enable the frame. • Use the **[Trackball]** to move the cursor to the frame on the frame marker which you want disable. • Press the left **[Set]** to disable the frame. The frame marker is changed from green to gray to indicate the frame has been disable.
 **Sample area drawing tools**	Sample area drawing tool • Ellipse

Display	Description
 **Graph layout selection**	Select a graph layout. • Graph with Contrast and 2D mode images in vertical format • Graph with Contrast image and Small Data Layout • Graph with Contrast image and Large Data Layout • Everything Layout • Graph with Contrast image • Graph with Contrast and 2D mode images in horizontal format
 **Cine control tools**	Use cine control tools. • **Run/Stop**: Start/Stop the cine loop review. • **Move First Frame**: Move to the first frame of cine loop. • **Move Last Frame**: Move to the last frame of cine loop.
 A -0.23000 -0.23000 -0.23000 -0.23000 -0.23000 -0.23000 -0.23000 -0.23000 **Max Gradient data**	Display the maximum gradient data. Max Gradient data is displayed when Small Data layout or Everything layout is selected while Curve fitting is off.
 ROI Size Sample Cine **Trackball controls and status**	Trackball controls and status • **ROI Size**: Press the **[Priority]** key. Move **[Trackball]** to adjust the ROI size. • **Sample**: Press the left **[Set]** key. Up to 8 sample areas can be set for the image. • **Cine**: Press the right **[Set]** key. Stop the cine run and you can move the frame by moving **[Trackball]**.

TIC Analysis Controls

The following table description the TIC Analysis controls.

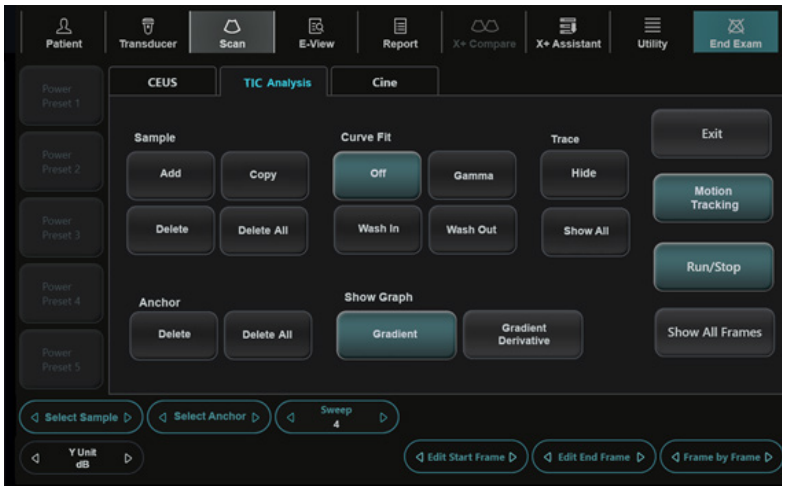
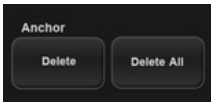
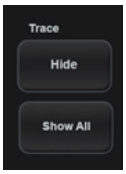
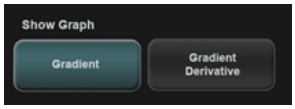
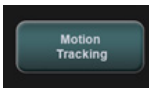
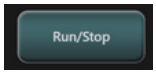
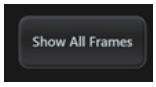
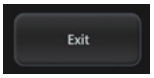
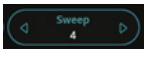
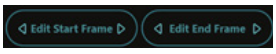


Figure 11-14 TIC Analysis touch screen

The following controls are available:

Control		Description
 **Sample**	**Add**	Add sample areas in the Contrast cine loop window and accompanying traces in the Analysis window. Up to 8 sample areas can be generated.
	Copy	Copy the sample ROI. Move the cursor over the sample ROI and select **Copy**. And then move the cursor to the desired location for the copied ROI and press the left **[Set]** key.
	Delete	Remove the selected sample area from the Contrast cine loop window and accompanying trace in the Analysis window. The Trackball marker must be pointed at an anchored sample area.
	Delete All	Remove all sample areas from the Contrast cine loop window and accompanying traces in the Analysis window.
 **Anchor**	**Delete**	Remove an anchor from a sample area.
	Delete All	Remove all anchors from a sample area.

 **Curve Fit**	**Off**	Remove the fitted curves from the plot and the fit parameters from the display.
	Gamma	Display the gamma curve. Used to find and estimate the gamma variate.
	Wash In	DIsplay the Wash In curve. Used to find and estimate the local perfusion rate using the contrast agent.
	Wash Out	Display the Wash Out curve. Used to find and estimate the local wash-out rate.
 **Trace**	**Hide**	Hide the trace.
	Show All	Show all traces.
 **Show Graph**	**Gradient**	Two graphs plot TIC and TIC gradient.
	Gradient Derivative	Two graphs plot TIC and TIC gradient derivative.
	**Motion Tracking**	Automatically adjust the sample ROI's placement across multiple frames in order to accommodate patient breathing or body movements.
	**Run/Stop**	Start/Stop the cine loop review.
	**Show All Frames**	Re-enable disabled frames.
	**Exit**	Exit TIC analysis.
	**Select Sample**	Select a sample area. The current sample area is changed to white.
	**Select Anchor**	Select an anchor. The current anchor is changed to white.
	**Sweep**	Adjust the sweep speed.
	**Y Unit**	Select the Y-axis unit.
	**Edit Start Frame**	Select the start frame and push to set the frame.
	Edit End Frame	Select the end frame and push to set the frame.
	**Frame by Frame**	Review the cine image frame by frame manually.

Generating a Trace

Up to eight traces can be generated.

Sample area

The sample area can be in three different states:

- Free sample area: Freely moving sample area before anchoring.
- Static sample area: The free sample area is anchored by pressing the **[Set]** key.
- Dynamic anchored sample area: The sample area is anchored in two or more frames. In these particular frames, the sample area is displayed with an anchor. The sample area moves smoothly between the anchored positions when playing/scrolling the cine loop.

Trace from a pre-defined sample area (Ellipse ROI)

1. Use **[Trackball]** to move the cursor to the Contrast cine loop window.
   The cursor is changed to a sample area. A preview of the trace is displayed in the Analysis window.
2. Press the **[Set]** key to anchor the sample area.
   In this frame, the sample area is marked with an anchor. If the cine loop has more than one heart cycle, a sample area will also be anchored in the corresponding frame in the next heart cycle.
   The trace is updated accordingly in the Analysis window.

Manual tracking of the sample area (dynamic anchored sample area)

The sample area can be moved within the loop to ensure that data in the trace is generated from the same anatomical location during the cyclic motion of the heart.

1. Place a sample area over a region of interest. Note the anatomical location of the sample area.
2. Scroll to a new frame using **[Trackball]**.
3. Use **[Trackball]** to move the cursor to the sample area, and press the **[Set]** key.
   The sample area is unanchored.
4. Use **[Trackball]** to drag the sample area to the corresponding anatomical location in the new frame and press the **[Set]** key.
   When the sample area is anchored in more than one frame, linear interpolation is performed so that the sample area is smoothly moved between the anchored positions in the selected frames when running the cine loop.

   NOTE
   In the original frame and this particular frame, the sample area is marked with an anchor.
5. Use **[Trackball]** to scroll through the cine loop and control that the sample area follows the moving anatomical structure.
6. If necessary, select **Add Sample** to add new sample area and repeat the above procedures to add anchored sample areas in several frames.
   You can obtain a more accurate displacement of the sample area.

Moving a dynamic anchored sample area

1. Press the **[Freeze]** key to freeze the image.
2. Select **<** or **>** of **Select Anchor** to browse through the cine loop to display one of the frames where the sample area was anchored.

   NOTE

   In these frames, the sample area is marked with an anchor.
3. Use **[Trackball]** to move the cursor to the sample area, and press the **[Set]** key.
   The sample area is unanchored.
4. Use **[Trackball]** to drag the sample area to a new location, and press the **[Set]** key.
   The sample area is anchored to the new location.

Deleting a trace

The user can delete all traces at once or one at a time.

To delete a trace from the plot,

1. Use **[Trackball]** to move the cursor over the sample area to delete and press the **[Set]** key.
2. Select **Delete** on the touch screen.
3. If necessary, select **Delete All** to delete all traces.

NOTE

The corresponding traces for the deleted sample areas are erased from the plot.

Disabling/Enabling the Frame

Frame disabling excludes the actual frame from the cine loop display. Frame disabling is available only with contrast data.

Disabling the frame from the frame marker

To disable one frame from the frame marker,

1. Use **[Trackball]** to move the cursor to the frame on the frame marker which you want disable.
2. Press the **[Set]** key to disable the frame.
   The frame marker is changed to light grey to indicate the frame has been disabled.

Enabling the frame

To enable the frames,

1. Use **[Trackball]** to move the cursor to the frame on the frame marker which you want enable.
2. Press the **[Set]** key to enable the frame.
   The previously disabled frame is re-enabled.
3. If necessary, select **Show All Frames** to all disabled frames are re-enabled.
   All previously disabled frames are re-enabled.

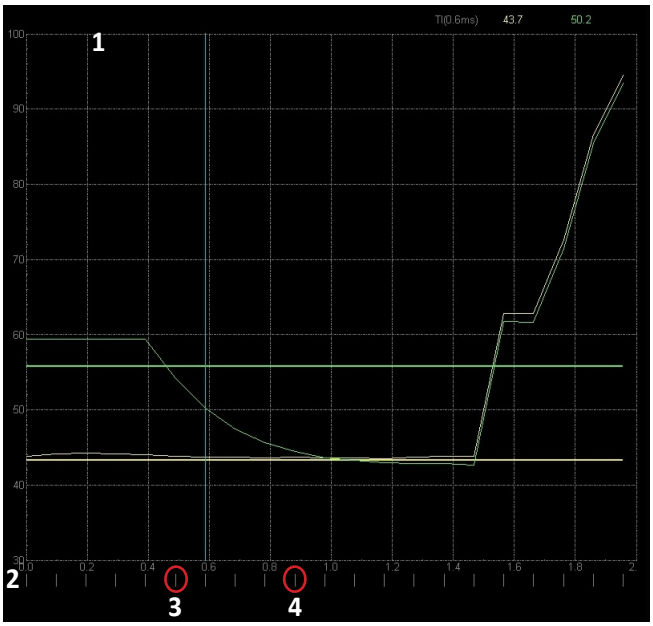


Figure 11-15 Frame markers

1	Analysis window	**3**	Enabled frame
2	Frame marker axis	**4**	Disabled frame

Trace Measurement

Gradient

Gradient is displayed on the screen instead of Intensity (db or AU). The gradient calculates from 7 points (includes previous and next frames).

TIC parameters

Following parameters are automatically calculated and displayed with the graph.

Parameter	Description
A, B, C, k, MSE	The coefficients and the mean square error for fitting curve equation. These parameters are displayed only on Large Data Layout with curve fitting.
TtoPK	Time to Peak
Area	Area Under the Curve
Grad	Mean Gradient for the peak intensity
Atm	Arrival Time

Max Gradient

Max Gradient is displayed when Small Data Layout and Everything Layout is selected while Curve fitting is off.

The time and gradient that becomes the maximum gradient between the cine start and end frame are displayed.

Showing graphs

To see TIC gradient graph,

– Select **Gradient** on the touch screen.
TIC and TIC gradient are plotted on two graphs respectively.

- Unit of Y-axis is dB or AU in case of intensity.
- The unit is d(db)/dt or d(AU)/dt in case of the intensity gradient.
- Gradient values for the current frame are displayed in the upper right corner of the graph.

To see TIC gradient derivative graph,

– Select **DeGradient** on the touch screen.
TIC and TIC gradient derivative are plotted on two graphs respectively.

- The Y-axis units is d2(dB)/dt2 or d2(AU)/dts in case of the intensity gradient derivative.
- Gradient derivative values for the current frame are displayed in the upper right corner of the graph.

Curve Fit

To see the fitted curves,

– Select **Off**, **Wash In** or **Wash Out** on the touch screen.

- **Off**: Remove the fitted curves from the plot and the fit parameters from the display.
- **Wash In**: Used to find and estimate the local perfusion rate using the contrast agent.
  Y(t) = A(1-exp(-kt)+B
- **Wash Out**: Used to find and estimate a local wash-out rate.
  Y(t) = Aexp(-kt)+B
- **Gamma**: Used to find and estimate the gamma variate.
  Y(t)=At^{c}exp(-kt)+B

Parameters of Gamma curve fitting

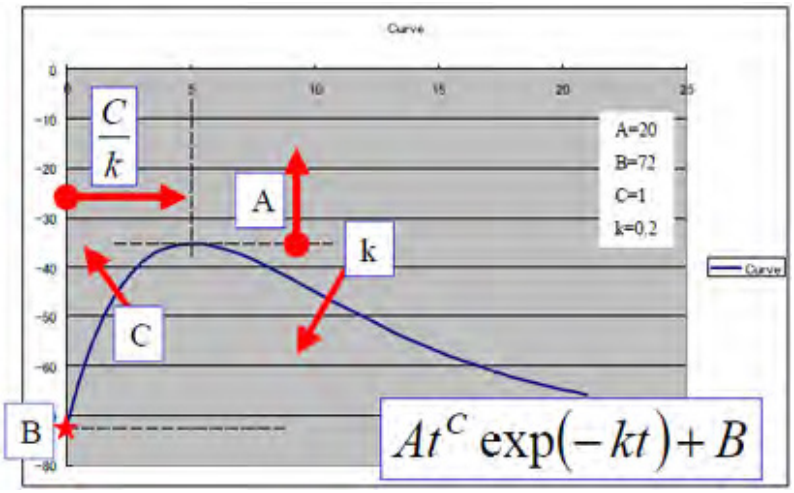


Figure 11-16 Gamma Curve

- t^c: Increasing function (C>0) for “Wash In”.
  For larger C, the intensity increases quickly before the peak.
- exp(-kt): Decreasing function (k>0) for “Wash Out”.
  For larger k, the intensity decreases quickly after the peak.
- B: Intercept intensity at t=0.
- The peak intensity of the curve is affected by all parameters.
  Larger A, larger B, larger C, and smaller k make larger peak.
  The peak time is calculated by C/k.
- MSE: Mean Square Error
  If the MSE is small, the difference of actual data and the fitted curve is small.

Printing TIC Data

To print TIC data,

1. Select **Run/Stop** on the touch screen to freeze the image.
   The still image can be get when cine loop is stopped by selecting **Run/Stop** on the touch screen.
2. Press the **[P1]** key (or the assigned print key) on the control panel.
   The system captures a single still frame onto the clipboard.
   You can see a thumbnail image on the clipboard.

Strain Elastography

Strain Elastography is a non-invasive method in which images demonstrating elasticity characteristics of tissue are used to help detect or classify tumors. It shows the spatial distribution of tissue elasticity properties in a region of interest by estimating the strain before and after tissue distortion caused by external or internal forces.

Strain Elastography is an optional feature. For using this feature, you need an additional request to your local agent.

Transducers and Intended Applications

The transducers and applications that support Strain Elastography are as follows:

Transducer type	Transducer	Application
Linear	L3-12X	Thyroid, MSK, Breast
	L10-25H	Thyroid, MSK, Breast
	SL3-19H	Thyroid, MSK, Breast
	SL3-19X	Thyroid, MSK, Breast
	L3-15H	Thyroid, MSK, Breast
	L3-8H	Thyroid, MSK, Breast
Endocavity	EV2-11H	OB, GYN, Urology
	EC2-11H	OB, GYN, Urology
	VE3-10H	OB, GYN, Urology

NOTE

It might be possible that some transducers or applications are NOT available in some countries.

Strain Elastography Display

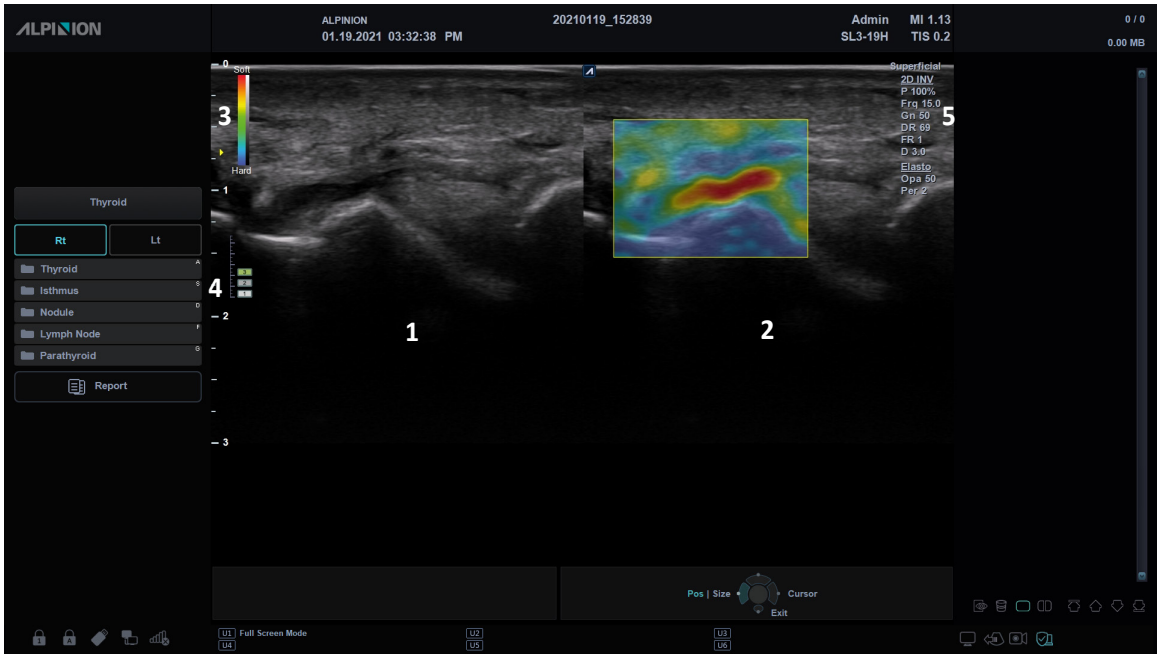


Figure 11-17 Strain Elastography Display

1	2D imaging	**4**	Quality bar
2	Strain Elastography imaging	**5**	Imaging parameters by mode
3	Color bar		

Color bar

The color bar indicates the stiffness of the tissue. The bottom of the color bar indicates that the target area is stiffer than the surrounding tissues, and the top of the color bar indicates that the target area is less stiff than the surrounding tissues.

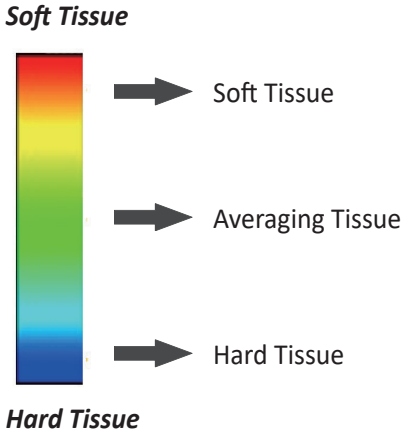


Figure 11-18 Color Bar

Quality bar

The quality bar indicates the compression quality. The low section of the bar indicates inappropriate tissue deformation for a quality elastogram and the upper selection indicates appropriate tissue deformation for a quality elastogram.

TIPS

Elastography requires virtually no external compression for reproducible strain imaging results, but, exceptionally manual compression is needed to acquire Elastography images, if you exam a denser nodule.

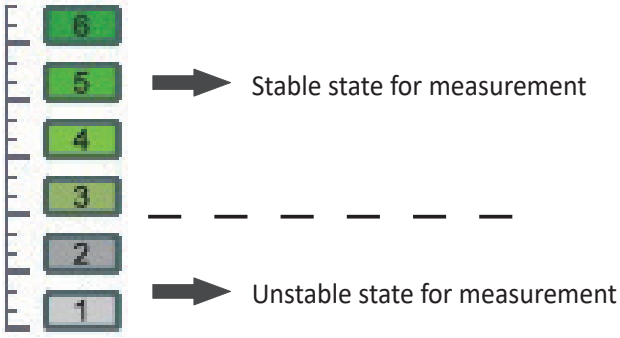


Figure 11-19 Compression Quality Bar

Strain Elastography Controls

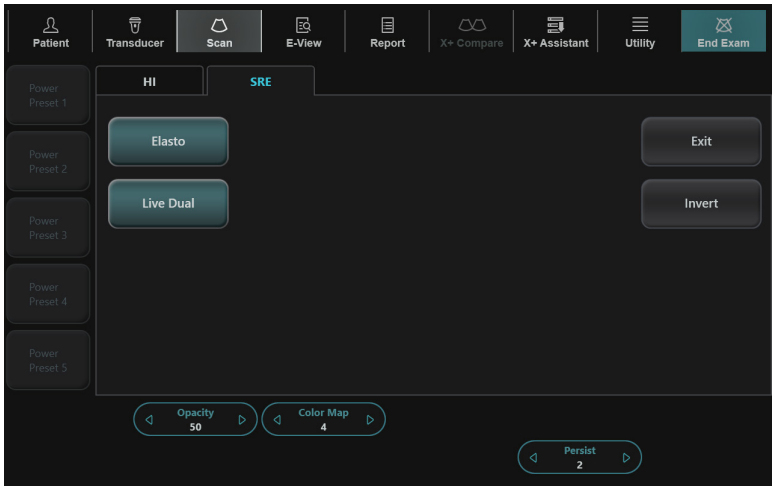


Figure 11-20 Strain Elastography Touch Screen

The following table describes the Strain Elastography controls.

Parameter	Description
Invert	Invert the color bar.
Persist	Change the temporal averaging rate.
Opacity	Adjust the opacity of the Elastography image.
Color Map	Change the type of color map.
Live Dual	Change the Elastography display layout. Adjust the display format of the 2D image and the Elastography image.

Performing Strain Elastography

CAUTION

The results achieved in Elastography mode always depend on the accuracy of the procedure performed. Any clinically relevant decisions need to be verified with some other state of the art methods.

To perform Strain Elastography,

1. Select **Elasto** on the touch screen.
   The system displays two images on the screen in a live, dual format. The left image is a 2D mode image with a region of interest (ROI). The right image is a 2D image with a corresponding ROI showing the elastogram.

   NOTE

   You can use user-defined key to activate Elastography. To assign the Elastography function to user-defined key, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select **Elasto**.

2. Perform the scan. Proper manual compression/decompression is displayed by the colored strain map.
3. Adjust the image parameters to obtain an optimized image.
   - **Invert**: Select **Invert** on the touch screen to activate or deactivate the invert.
   - **Persist**: Rotate the **Persist** soft key to adjust the persist function.
   - **Opacity**: Rotate the **Opacity** soft key to adjust the opacity of the Elastography image.
   - **Color Map**: Rotate the **Color Map** soft key to change the type of color map.
4. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
5. To perform the measurement, press the **[Caliper]** key on the control panel.
6. Save the image if necessary.
7. To exit the Elastography mode, select **Exit** on the touch screen.

Strain Elastography Display Layout

To change the Elastography display layout,

– Select **Live Dual** on the touch screen. The values are On and Off.

Elastography dual layout (Elastography Dual mode)

The Elastography image and the 2D image are displayed side-by-side on the screen. The 2D image is shown on the left and the Elastography image is shown on the right.

Elastography single layout (Elastography Single mode)

The Elastography image is displayed alone on the screen.

Performing a Measurement

Elasto Size Compare

Elasto Size Compare applies the measured data in 2D mode to Elastography mode. Size of lesion in 2D mode and Elastography mode can be compared to have more accurate diagnose result.

NOTE

Elasto Size Compare is only available to use on freezing in Elastography mode.

Figure 11-21 Elasto Size Compare Display

1. Press the **[Caliper]** key on the control panel.
2. Select **Elasto Size Compare** on the touch screen.
3. Use **[Trackball]** to move the marker to the start point on the 2D image, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The copied caliper appears on the Elastography image area.
6. Use **[Trackball]** to move the marker of the copied start point to the desired position on the Elastography image, and press the **[Set]** key.
   The copied start point is fixed, and the copied end point appears.
7. Use **[Trackball]** to move the marker of the copied end point to the desired position on the Elastography image, and press the **[Set]** key.
8. The measured value is fixed. The two values and one ratio are shown on the ***Result*** window.

NOTE

Elasto Size Compare is not available through the factory default. To configure the Elasto Size Compare, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Elasto Size Compare**.

Elasto Strain Ratio

Elasto Strain Ratio provides quantitative information. It is calculated by comparing the strain of a lesion to the surrounding normal tissue. Soft tissue will have higher strain values than stiff tissue. It is displayed as a real-time color map of the relative elasticity.

NOTE

Elasto Strain Ratio is only available to use on freezing in Elastography mode.

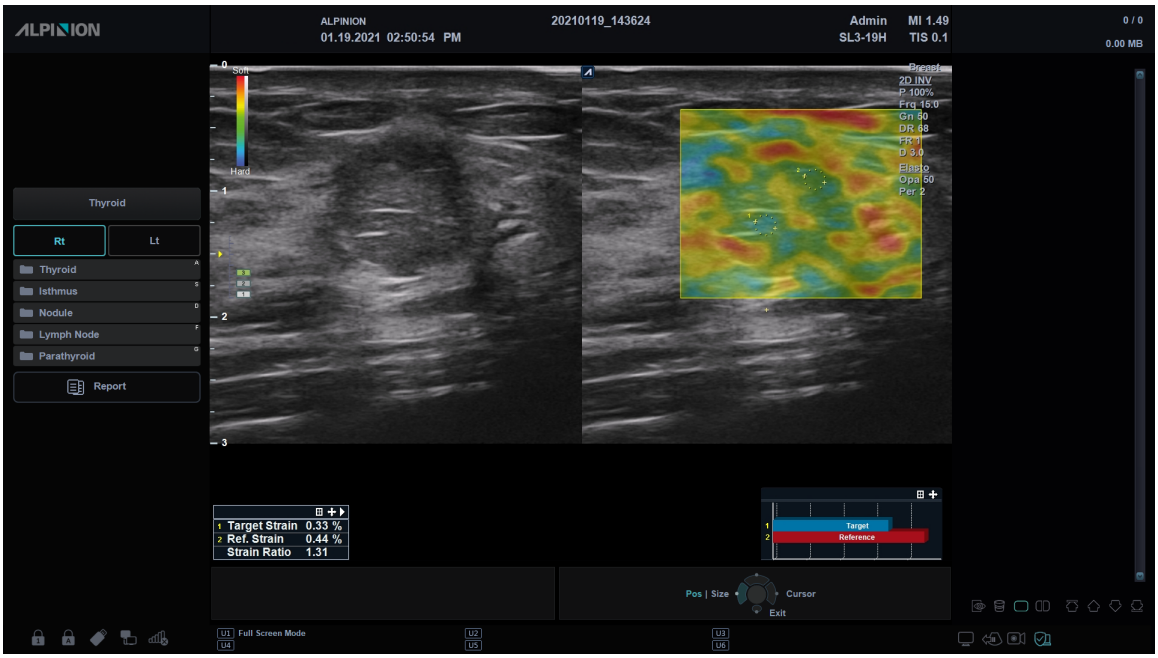


Figure 11-22 Elasto Strain Ratio Display

1. Press the **[Caliper]** key on the control panel.
2. Select **Elasto Strain Ratio** on the touch screen.
3. Use **[Trackball]** to move the marker to the start point on the Elastography image, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
   The target strain is shown on the ***Result*** window.
5. The copied caliper appears on the Elastography image area.
6. Use **[Trackball]** to move the marker of the copied caliper to the reference strain point on the Elastography image, and press the **[Set]** key.
   The reference strain is shown on the ***Result*** window.
7. The measured value is fixed. The strain ratio is shown on the ***Result*** window.

NOTE

Elasto Strain Ratio is not available through the factory default. To configure the Elasto Strain Ratio, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Basic MEAS.** > **Elasto Strain Ratio**.

Strain bar graph

The target and reference bars in graph are used to represent the levels of strain values. It is easy to compare the strain values of target and reference with the strain bar graph.

Figure 11-23 Elastography Strain Bar Graph

Point Shear Wave Elastography (X+ pSWE)

WARNING

Point Shear Wave Elastography should only be used as a complement to other diagnostic techniques when making diagnostic decisions.

Point Shear Wave Elastography is a feature that provides elasticity information of human tissue, which is used as a clinical diagnostic indicator when diagnosing tumor or liver cirrhosis using the velocity of shear wave propagation.

Point Shear Wave Elastography is an optional feature. For using this feature, you need an additional request to your local agent.

Transducers and Intended Applications

The transducer and application that support point Shear Wave Elastography are as follows:

Transducer type	Transducer	Application
Convex	SC1-7H	Abdomen

CAUTION

Point Shear Wave Elastography is not intended for use for Obstetrical exams.

NOTE

It might be possible that some transducers or applications are NOT available in some countries.

Point Shear Wave Elastography Display

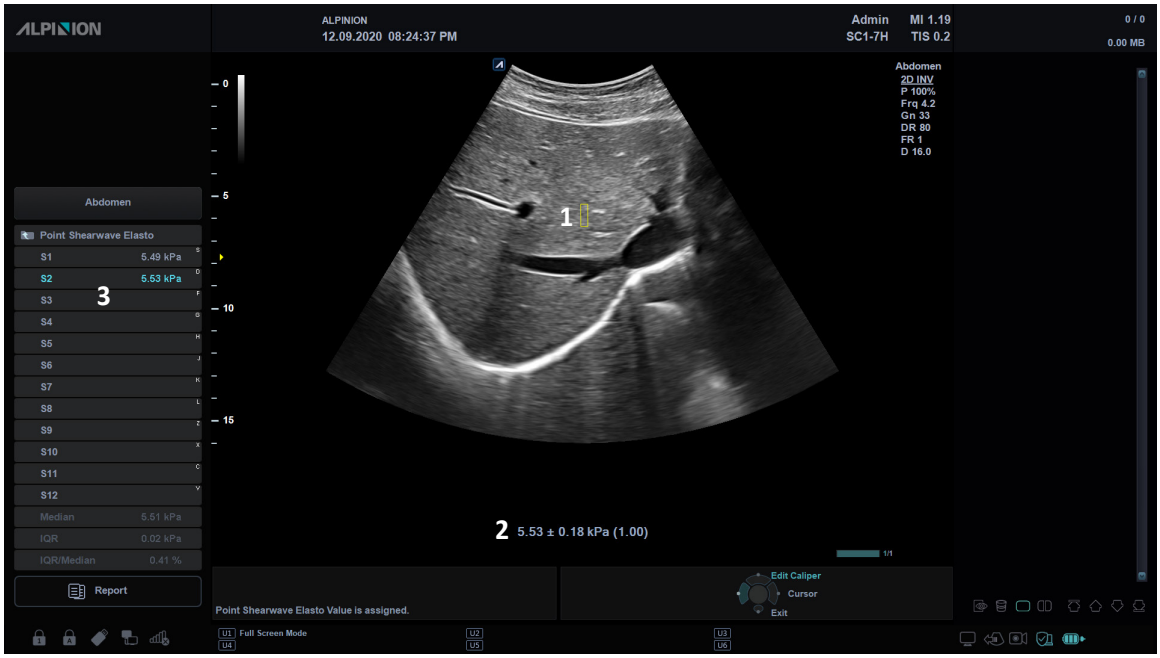


Figure 11-24 point Shear Wave Elastography Display

1	Point Shear Wave Elastography ROI	**3**	Point Shear Wave Elastography measurement package
2	Value of stiffness		

Point Shear Wave Elastography Controls

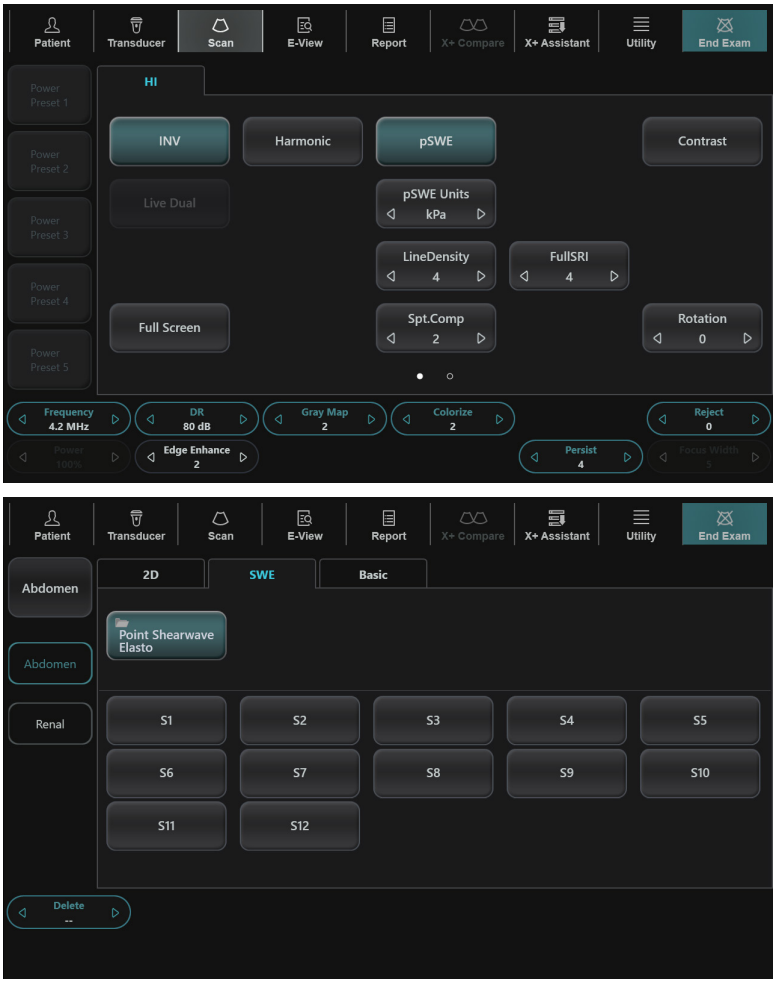


Figure 11-25 point Shear Wave Elastography Touch Screen

The following table describes the point Shear Wave Elastography controls.

Parameter	Description
X+ pSWE Units	Set the point Shear Wave Elastography display units to either of the following settings: • **kPa** (kiloPascals): Stiffness • **m/s** (meters per second): Velocity
Delete	Select and delete the measured value. • Rotate to select the measured value (S1 - S12). • Push to delete the selected value.

Performing Point Shear Wave Elastography Measurement

To perform point Shear Wave Elastography measurement,

1. Select **pSWE** on the touch screen.
2. If necessary, instruct the patient that during the exam they can mostly breathe normally. However, advise the patient that they will need to suspend their breathing mid breath so that you can obtain an optimum image while performing the scan.
3. Select **X+ pSWE** Units on the touch screen to set the point Shear Wave Elastography display units.
   There are two types of measurement units for quantifying stiffness.
   - **m/s**: Velocity (meters per second)
   - **kPs**: Stiffness (kiloPascals)
4. Use **[Trackball]** to move the ROI box.
5. Press the **[Priority]** key to obtain the desired frame.
   The stiffness is calculated and shown on the display.
6. To complete the measurement, press the **[Measure]** key.
   The measured value is fixed and assigned to the corresponding sample.
7. Repeat steps 3 through 6 for the remaining samples.
   Typically, users obtain twelve (12) samples.
8. Once measurements for all samples are complete, touch **Report** on the touch screen.
   The ***Report*** screen appears.
9. Select **Shear Wave Elasto** on the touch screen to view saved measurements.

Reviewing pSWE Results

The measurement results are summarized in the report.

To reivew the values of stiffness,

1 Touch **Report** on the touch screen. The ***Report*** screen appears.

2 Select **Shear Wave Elasto** on the touch screen to view the values of stiffness.

Figure 11-26 pSWE Results in Report

Measurement Bias Information Table

The Measurement Bias Information table displays the bias and precision percentage at incremental depths (Bias/Precision vs. Depth, in centimeters) for the shear wave transducer.

Unit: [kPa]						
	8 kPa		18 kPa		36 kPa	
Depth	Bias	Precision	Bias	Precision	Bias	Precision
4.0 cm	-11 %	5 %	-10 %	2 %	6 %	2 %
5.0 cm	-15 %	3 %	-12 %	2 %	8 %	2 %
6.0 cm	-16 %	3 %	-17 %	1 %	4 %	1 %
7.0 cm	-18 %	2 %	-15 %	2 %	3 %	2 %

Unit: [m/s]						
	1.6 m/s		2.5 m/s		3.5 m/s	
Depth	Bias	Precision	Bias	Precision	Bias	Precision
4.0 cm	-5 %	2 %	-8 %	1 %	0 %	1 %
5.0 cm	-8 %	1 %	-9 %	1 %	2 %	1 %
6.0 cm	-8 %	1 %	-12 %	0 %	-1 %	0 %
7.0 cm	-9 %	1 %	-11 %	1 %	-1 %	1 %

Auto EF Measurements

Auto EF (Automated Ejection Fraction) is a semi-automatic measurement tool used for measurement of the global EF (Ejection Fraction).

Auto EF is an optional feature. For using this feature, you need an additional request to your local agent.

Auto EF Result Display

Figure 11-27 Auto EF Result Display

Performing an Auto EF Measurement

To measure the Ejection Fraction (EF) automatically,

1. Connect the ECG device and activate the ECG function to acquire a stable ECG trace.
2. Acquire 2D cine images of an Apical 4 chamber view and an Apical 2 chamber view by pressing the **[Freeze]** key.
3. After acquiring the cine images, press the **[Measure]** key and select **Auto EF** on the touch screen. The ***Auto EF*** screen appears.
4. Select the name of current cadiac view (**A4C**, **A2C**) on the touch screen.
   An endocardial border will automatically be traced.
5. If necessary, select the ECG cycle from the ***ECG Cycle*** drop-down list, and select **Calc.** to start the calculation.
   When the processing is completed, the Ejection fraction is automatically calculated again.

6 If necessary, select **Edit EDV** or **Edit ESV** to edit the endocardial border trace.
You may adjust the trace by moving the cursor over the endocardial border trace, select an anchor point and drag it to a new location. The shape of the endocardial border trace is updated accordingly.

7 When the editing is completed, select **Calc.** to start the calculation.

8 The resulting Ejection Fraction (**EF**), the End Diastolic volume (**EDV**) and the End Systolic Volume (**ESV**) are displayed in a table on the right.

NOTE

The Biplane results will only appear on screen after measuring both A2C and A4C views.

9 To save the result, select **Save Result** on the touch screen. The results are shown on the ***Report*** screen.

10 To exit Auto EF, select **Exit** on the touch screen.

Reviewing EF Results

The measurement results are summarized in the report.

To reivew the values of Ejection Fraction,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of Ejection Fraction.

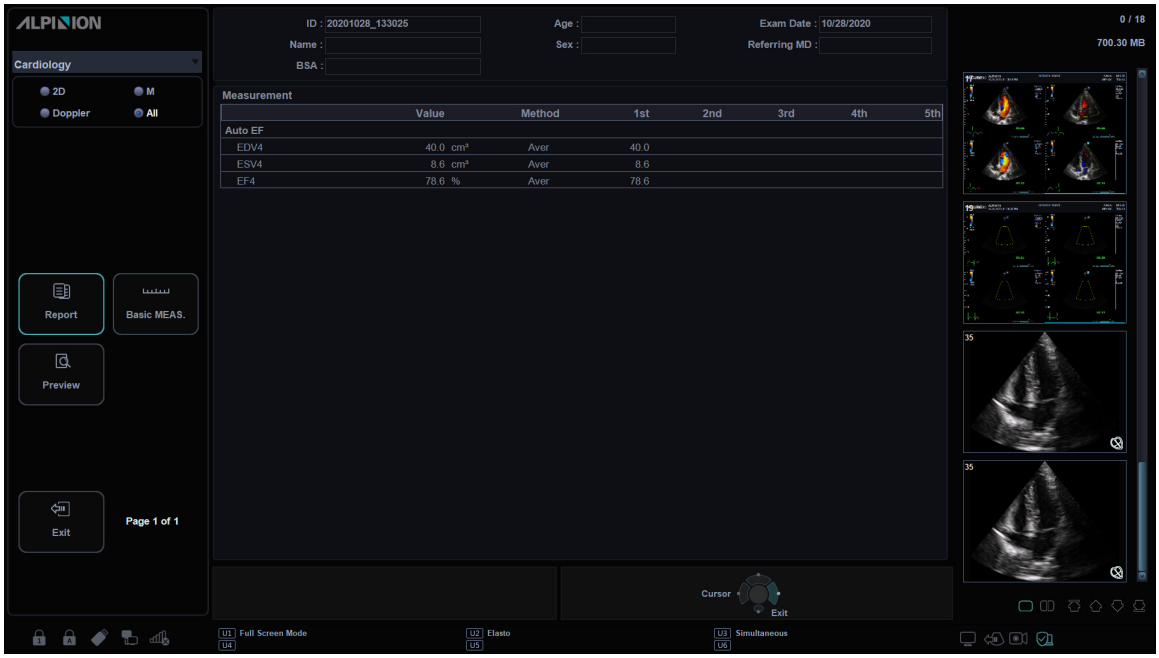


Figure 11-28 Auto EF Results in Report

Stress Echo

WARNING

Stress Echo data are provided for reference only, not for confirming diagnoses.

The X-CUBE 70 Ultrasound System provides a stress echo package that integrates image acquisition, image optimization, review, wall motion scoring and reporting for accurate and efficient stress echo examination.

The stress echo package provides protocol templates for two types of stress echo examination (exercise and pharmacological stress).

In addition to the preset factory protocol templates, you can create or modify templates according to your needs.

To perform this function, you need to proceed the following procedure in serial order: Selection of protocol template, Acquisition/Selection, and Review/Scoring. The following table describes how each step takes a role:

Procedure	Description
Selection of protocol template	Select a protocol template.
Acquisition/Selection	Acquire a stress image according to the selected protocol template, and select stress images to be used for reviewing.
Review/Scoring	Review the previously saved images and assign scores to each cardiac segment.

Protocol Editor

Protocol Editor allows you to create, edit, and delete stress echo protocols. When you create or edit a protocol, you can set the number of stage, the number of loops acquired for each view in the stage, and the standard views to include. You can define the stage type (continuous or non-continuous) and names for protocol/stage/view.

To access Protocol Editor,

– Click **Protocol Editor** on the ***Protocol Selection*** window.

– Go to **Utility** > **Setup** > **SystemPreset** > **Advanced Cardiac** > **Protocol Editor**.

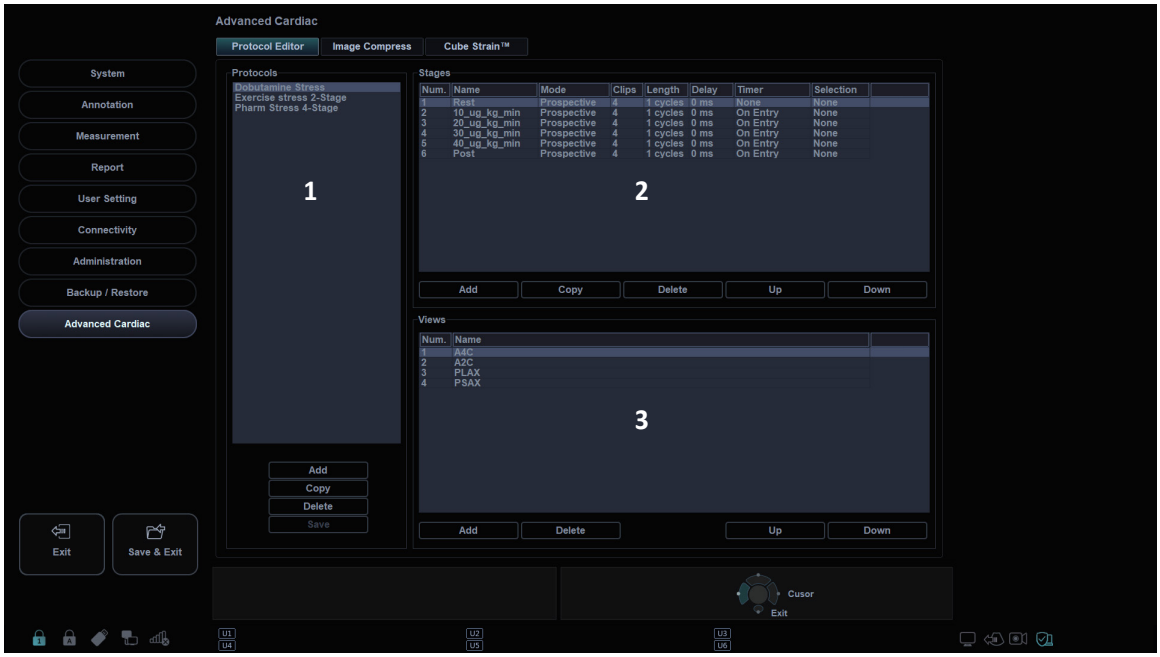


Figure 11-29 Protocol Editor

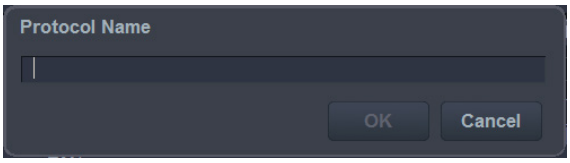
1	Protocols category	**3**	Views category (max. 7 views)
2	Stages category (max. 8 stages)		

Editing an existing protocol

1. Double-click a stage to edit from the stage list.
2. Change the stage settings and click **OK**.
3. To change the stage or view order, click **Up** or **Down** from the **Stages** or **Views** category.
4. To copy the protocol or stage, click **Copy** from the **Protocols** or **Stages** category.
5. To delete the protocol, stage, or view, click **Delete** from the corresponding category.
6. To save the changes, click **Save**.
7. When you have finished, click **Save & Exit** to exit from the Protocol Editor page.

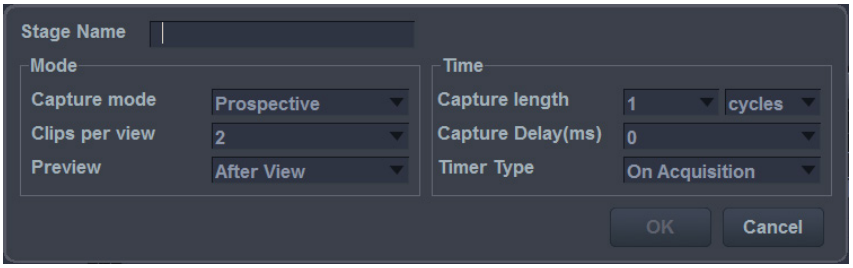
Creating a new protocol

1 On the **Protocols** category, click **Add** to create a new protocol and click **OK**.
If necessary, change the default protocol name.



2 From the **Stages** category, click **Add** to create a new stage and click **OK**.
If necessary, edit or select a name for the new stage (Baseline, Pre exercise, Low dose, Peak dose, Peak exercise, Post exercise, Recovery).

3 Set the following stage options:



- **Capture mode**: Define the type of Capture mode.
  - **Continuous**: Acquisition runs for a defined time period. During this time, all views in a stage are acquired.
  - **Prospective**: After starting the acquisition, the next loop is acquired for one view in a stage.
  - **Retrospective**: After starting the acquisition, the last loop is stored for one view in a stage.
- **Clips per view**: Define the clip number per each view (1 to 4 clips).
- **Preview**: Configure to review and select cine loops before store.
  - **After View**: Configure to preview and select cine loop after completing image acquisition for each view.
  - **After Stage**: Configure the system to automatically acquire cine loops for one stage of the protocol.
  - **None**: Configure the system to automatically acquire cine loops for all stages of the protocol.
- **Kind of Capture length**: Define the unit of the capture length (Cycles or Time). If you change the unit of the capture length to Time, you can operate the Stress Echo function with ECG deactivated.
- **Capture length**: Define the capture length (up to 3 cycles and 3000 ms).
- **Capture Delay(ms)**: Define the capture delay time.
- **Timer Type**: Define the timer type (On Entry, On Acquisition, None).

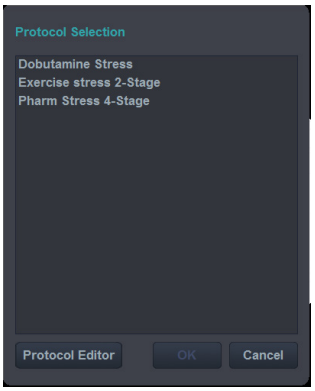
4 From the **Views** category, click **Add** to create a new view and click **OK**. (A2C, A3C, A4C, PLAX, PSAX, SAX-APEX, SAX-BASE)

5 To save the settings, click **Save**.

6 When you have finished, click **Save & Exit** to exit from the Protocol Editor page.

Selecting a protocol template

1. To acquire Stress Echo loops, activate the ECG function.
2. On the touch screen, touch **Utility** and then touch **Stress Echo**.
   The ***Protocol Selection*** window appears.



NOTE

You can use user-defined key to activate Stress Echo. To assign the Stress Echo function to user-defined key, go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **StressEcho**.

3. The ***Protocol Selection*** window lists all the available protocols. The default list includes the following protocols:
   - **Dobutamine Stress**
   - **Exercise stress 2-Stage**
   - **Pharm Stress 4-Stage**
4. Select the desired protocol by choosing the protocol name and click **OK**.
   The real-time imaging screen appears.

Image Acquisition

Images are acquired in a pre-defined order, according to the selected template.

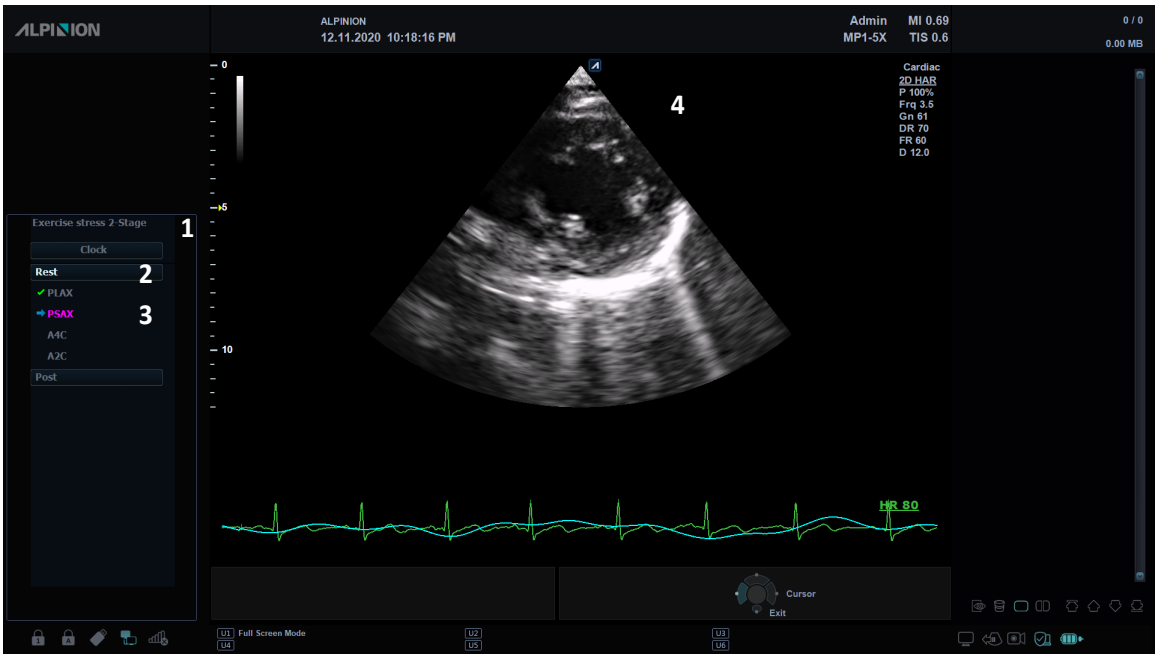


Figure 11-30 Stress Echo Acquisition Display

1	Selected protocol	**3**	Current view
2	Current stage	**4**	Currently acquired image

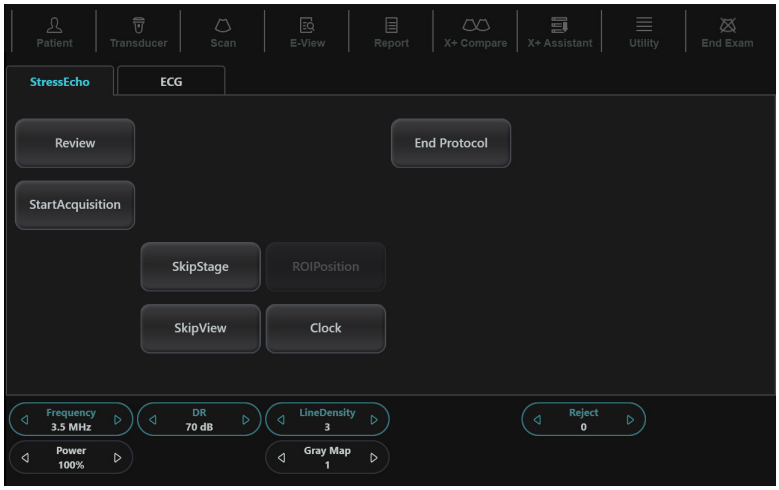


Figure 11-31 Stress Echo Acquisition Touch Screen

The following table describes available acquisition menus on the touch screen.

Parameter	Description
StartAcquisition	Start image acquisition.
SkipView	Select the next view in the current stage. You can cancel the view.
SkipStage	Select the next stage. You can cancel the stage.
ROIPosition	Adjust the ROI position during acquisition.
Clock	Display the elapsed time from the start of the stress exam.

Starting image acquisition

1 If necessary, optimize the image by use the following options:

- **Frequency**: Adjust the operating frequency of the transducer.
- **DR**: Adjust the dynamic range.
- **Line Density**: Optimizes 2D-mode frame rate or spatial resolution for the best possible image.
- **Reject**: Reduce noise in the image.
- **Power**: Control the amount of acoustic power.
- **Gray Map**: Adjust the gray map.

2 To start image acquisition, press the **[Freeze]** key on the control panel or select **StartAcquisition** on the touch screen.
The system displays the ***Protocol*** window on the left of the screen, listing the stages for the selected protocol along with the views of first stage. The system selects the first view for acquisition by default, indicating the selected view by placing an arrow mark ( ) to the left of the view name.

3 Select **Accept** on the touch screen. Saved views are marked with a green check mark ( ).

– If the system is configured to preview the cine loop before storing, select **Accept** to save the acquired cine loop for the selected view.

– If you do not want to store the cine loop, select **Reject** on the touch screen and perform image acquisition again.

NOTE

If you select **After Stage** or **None** on the **Stage** category of the Protocol Editor, **Accept** and **Reject** on the touch screen are disabled.

4 After storing the cine loop, the system automatically highlights the next available view to be acquired.

5 Repeat previous step until all required views are completed.

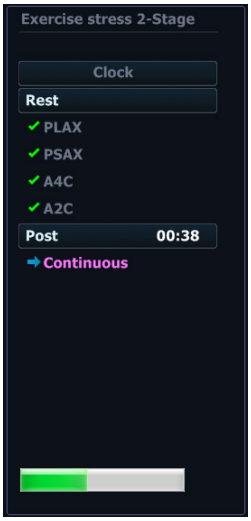
6 When image acquisition is completed for all views, select **Scoring** on the touch screen to perform review and scoring.

Continuous Capture Mode

Activating Continuous Capture

Continuous Capture mode enables the user to perform acquisition continuously for all views at any level depending on the selected template configuration. To run Continuous Capture, the user has to select a template where this feature is activated.

1. To start image acquisition, press the **[Freeze]** key on the control panel or select **StartAcquisition** on the touch screen. **Continuous** is shown with an arrow mark ( ) and the progress bar appears.



2. To stop capture, press the **[Freeze]** key on the control panel.
3. When image acquisition is completed for all views and continuous stages, the system automatically stops capture and switches to ***Continuous Capture Selection*** screen.
4. Assign the cine loops to the views.
   a. Use **[Trackball]** to select the desired view name.
   b. Press the **[Set]** key. The selected view name is highlighted.
   c. If necessary, rotate the **[Select]** key to advance to the next group of images in the current view.
   d. Use **[Trackball]** to select the desired loop to assign it to a particular view.
   e. Press the **[Set]** key. The frame of the selected image is highlighted.
   f. Repeat previous steps to assign loops to the other views.
5. Select **Scoring** on the touch screen to perform review and scoring.

Image Selection

When the image acquisition is completed, ***Selection*** screen is displayed automatically, and you can select the preferred loop for each view.

The selected images are used for review and wall motion scoring.

NOTE

If you want to set clips per view, go to **Utility** > **Setup** > **SystemPreset** > **Advanced Cardiac** > **Protocol Editor** > select **Protocol** > double click **Stage** > set the Clips per view (1–4).

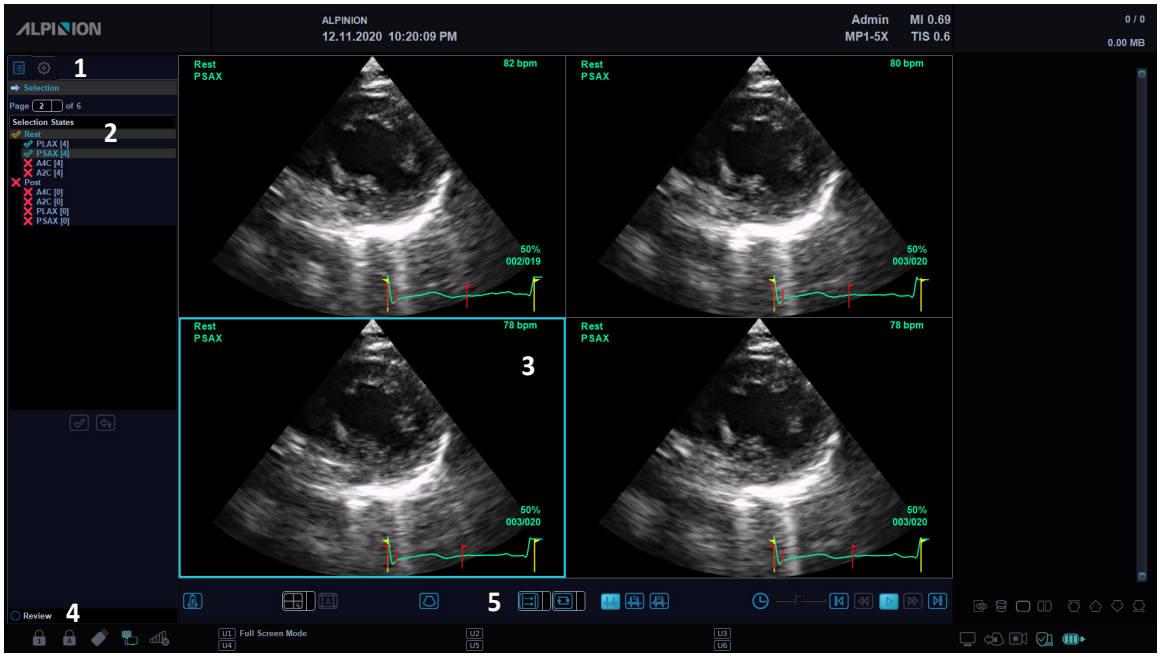
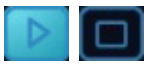


Figure 11-32 Stress Echo Selection Display

1	Protocol/Protocol Editor	**4**	Review
2	Selected stage/view	**5**	Image selection controls (Toolbar buttons)
3	Selected cine loops		

On the ***Selection*** screen, the following toolbar buttons are available:

Icon	Name	Description
	Enter Acquisition	Go to the ***Acquisition*** screen.
	Selection Layout	Select the image layout. (1X1, 2X1,2X2, 3X3, 4X3…)
	Auto layout	Provide the automatically optimized layout for your selected images.
	Show/Hide Overlays	Show or hide the overlaid window indicating the relevant stages or views.
	Sync Mode Selection	Free, Start, Align
	Playback Mode Selection	Loop, Once, Sweep
	R-R Full (Full heartbeat)	Display the complete loop (all loops).
	Systole	Display the systole segment only (all loops).
	Diastole	Display the diastole segment only (all loops).
	Speed of loop playback	Change the speed of loop playback.
	Toggle Play	Play back the loops when enabled. When disabled, display one frame for each loop.
	Start of sequence	Display the first frame of each loop.
	Step backward	Display the previous frame of each loop.
	Step forward	Display the next frame of each loop.
	End of sequence	Display the last frame of each loop.

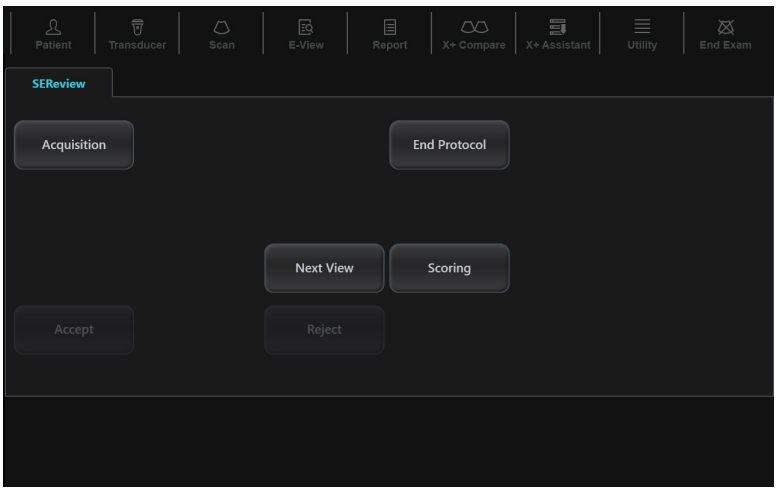


Figure 11-33 Stress Echo Selection Touch Screen

The following table describes available selection menus on the touch screen.

Parameter	Description
Acquisition	Go to the ***Acquisition*** screen. You can acquire images until one stage is completed.
Accept	Save the acquired cine loop for the selected view. The selected view is marked with a green-colored check mark.
Reject	Cancel to save the acquired cine loop and return to the scanning. The selected view is marked with a red-colored arrow mark.

Selecting preferred cine loops

To select the preferred loops to assign to the stress protocol views,

1. On the ***Selection*** screen, use **[Trackball]** to select the desired view name.
2. Press the **[Set]** key. The selected view name is highlighted.
3. Rotate the **[Select]** key to display the next group of images in the current view.
4. Use **[Trackball]** to select the desired loop to assign it to a particular view of the stress template.
5. Press the **[Set]** key. The frame of the selected image is highlighted.
6. Repeat steps 1–5 to assign loops to the other views.
7. When image selection is completed, select **Scoring** on the touch screen to perform review and scoring.

Review and Scoring (Wall Motion Scoring)

Review/Wall motion scoring (WMS) consist of viewing previously saved loops and assigning scores to each cardiac segment, in order to quantify the function of the muscle or wall segment.

The quad screen is the standard display for comparing heart cycles.

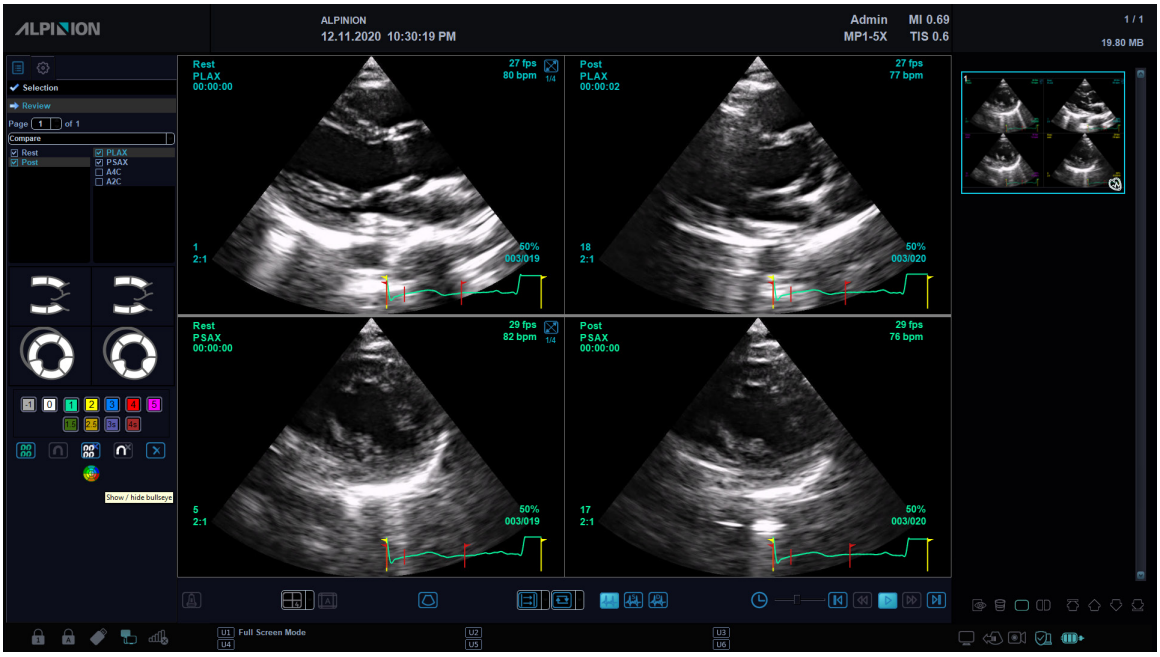


Figure 11-34 Stress Echo Review Display

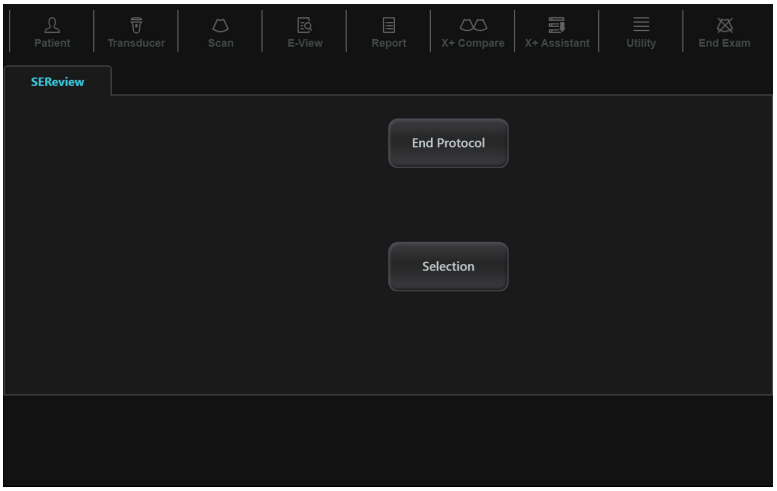


Figure 11-35 Stress Echo Review Touch Screen

On the ***Review*** screen, the following icons are available:

Icon	Name	Description
	Score point	Indicate the each segment's wall-motion score by color
	All Visible Loops Normal	Assign a normal wall motion score to all currently displayed views.
	Selected Loop Normal	Assign a normal wall motion score to the selected view.
	Reset All Visible Loops Normal	Reset a normal wall motion score to all currently displayed loops.
	Reset Selected Loop Normal	Reset a normal wall motion score to the currently selected view.
	Reset All View	Reset wall motion scores to all views.
	Bull's Eye	View the LV motion scoring diagram.

With scoring the wall motions, you can review and compare images between stages and views.

1. Select **Review** on the left bottom of the screen. The ***Review*** screen appears.
2. In Review mode, use the following options:
   - **Sort by Stage**: Sort images by stage. Select the gray check box next to each required stage.
   - **Sort by View**: Sort images by each image view. Select the gray check box next to each required view.
   - **Compare**: Compare between the images. Select the gray check box next to each required stage or view.

   NOTE

   Shuffle mode is available. The system displays all loops that represent the selected stage or view.
3. Perform review and scoring the wall motion.
4. When you have finished, select **End Protocol** on the touch screen. The ***Save*** window appears.
5. To save the result, select **Yes**. The selected loops and their wall-motion scores are saved.
6. To delete the result, select **Cancel**. All of the current results are deleted.

Scoring a LV wall motion

Left Ventricle Wall motion scoring (WMS) represents the score results as the Left Ventricle images. Abnormal motions are scored by colorizing the segments in the symbol.

1 Select a score point.

Score	Degree of abnormality of wall motion	Color
-1	Hyperkinesis	Gray
0	Not evaluated	Colorless
1	Normal	Green
1.5	Mild Hypokinesis	Blue-green
2	Moderate Hypokinesis	Yellow
2.5	Severe Hypokinesis	Lemon
3	Akinesis	Blue
3s	Akinesis with Scar	Purple
4	Dyskinesis	Red
4s	Dyskinesis with Scar	Scarlet
5	Aneurysm	Pink

2 Use **[Trackball]** to move the cursor to a segment in one of the scoring diagrams and press the **[Set]** key.

3 The scored motion is colored and displayed in the relevant segment area in the diagram.

4 To score the relevant segments, repeat steps 1–3.

WMS report

In addition to the standard information included in the WMS report, you can include or exclude data to a specific stage. The WMS graphics of the each view on the report indicate the each segment's wall-motion score by color or degree of shading.

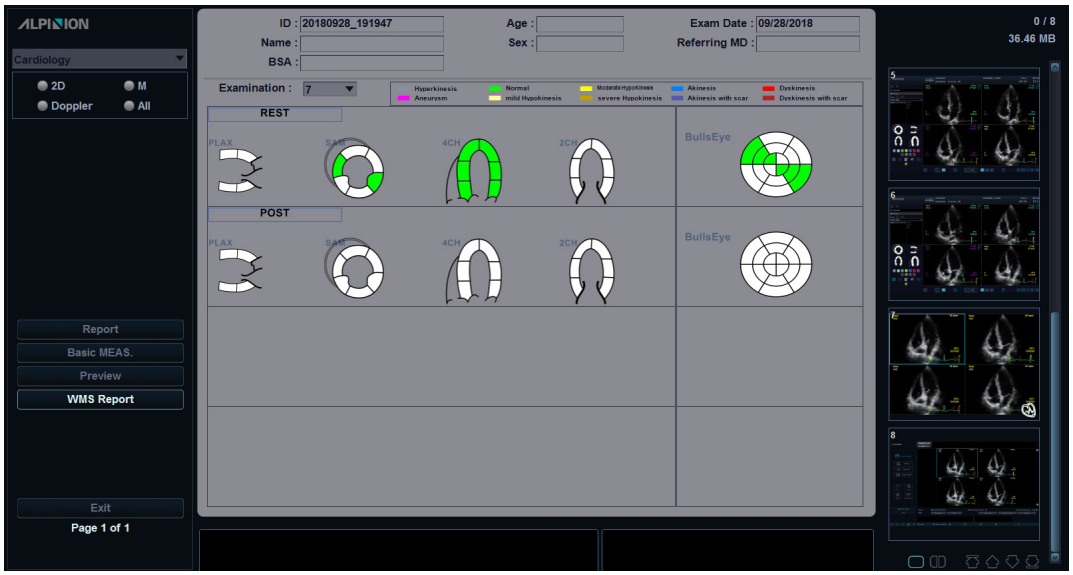


Figure 11-36 WMS Report

To activate the WMS report,

1. Select **End Protocol** to exit Stress Echo and save the current results.
2. Touch **Report** on the touch screen. The ***Report*** screen appears.
3. Select **WMS Report** on the context menu.

To enter comments on the WMS report,

1. Select **Comment** on the touch screen. The ***Comment*** screen appears.
2. Enter comments in the ***Comments*** field.
3. When you have finished entering comments, select **Preview** on the context menu to preview comments. You can see comments in the ***Comments*** field.

To preview and print the WMS report,

1. From the ***Report*** screen, select **Preview** on the context menu.
2. Preview the report for the currently selected mode.
3. To print the report, select **Print** on the touch screen.

Reviewing a stored Stress Echo

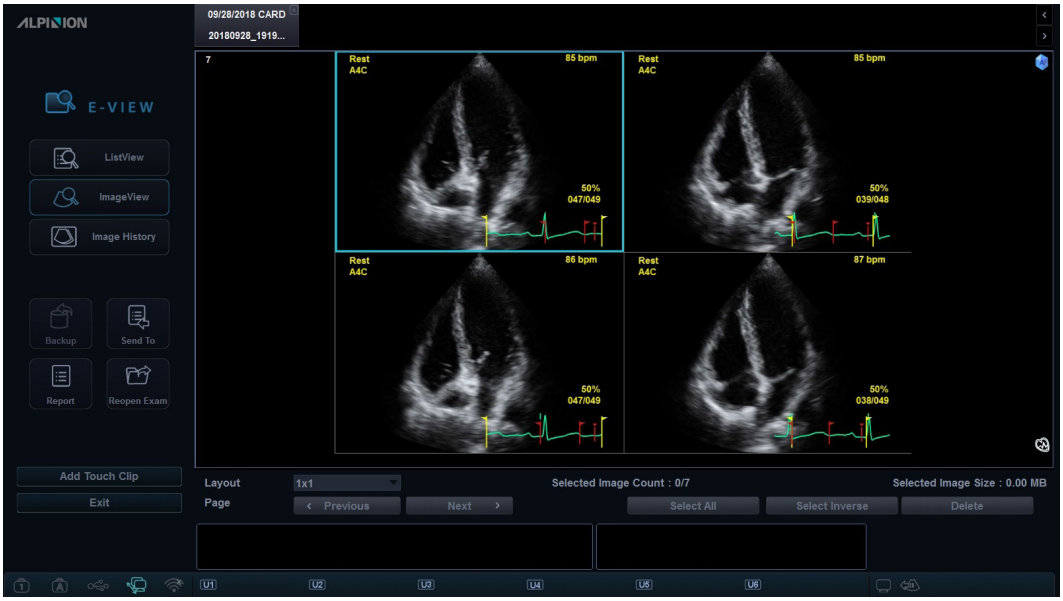


Figure 11-37 Reviewing Stress Echo via E-view

To review a stored Stress Echo,

1. Touch **E-View** on the touch screen.
2. To review the Stress Echo, select the image.
   The selected image is highlighted.

   NOTE

   The Stress Echo exam displays as a single image with a stress echo icon placed on the image.
3. Select **Review** on the touch screen.

Image Compression

Stress Echo supports a four-level image compression. (High, Medium, Low, Uncompressed).

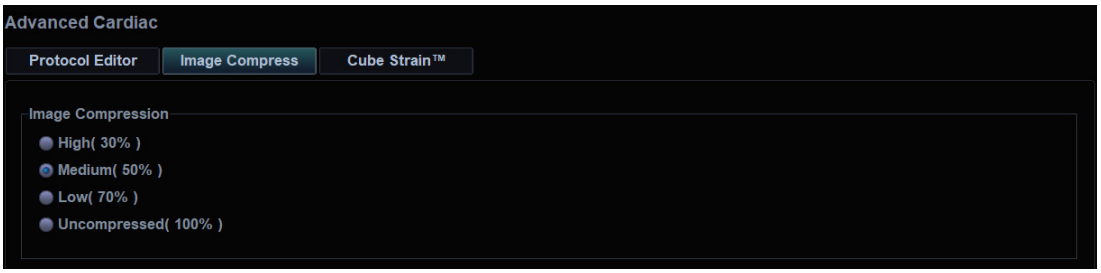


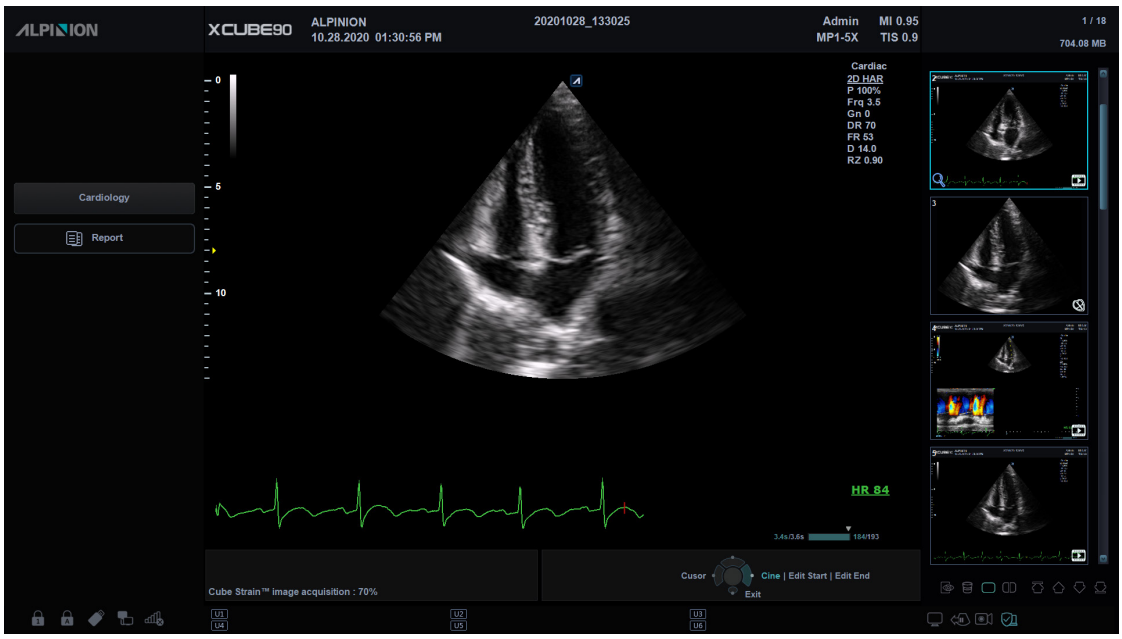
Figure 11-38 Image Compression

Cube Strain™

Cube Strain™ is an optional cardiac application that provides advanced motion and velocity information of the myocardial tissue. On a basis of 2D speckle tracking technology, the angle independent analysis of this function allows you to assess accurate strain and calculate strain rate of the myocardium, especially for fetal heart. With the enhanced graphic display, you can easily and quickly identify wall motion change.

Acquiring Images and Activating Cube Strain

1. Connect the ECG device and make sure to obtain a stable ECG trace.
2. Acquire 2D mode cine loops of cardiac view.



3. If necessary, optimize the image by using imaging optimization controls.
4. Adjust the width and depth to increase the frame rate.
   The frame rate should be more than 60 frames per second. A higher frame rate is recommended for high heart rate.
5. To activate Cube Strain, select **Cube Strain** on the touch screen.
   The ***View selection*** window appears.

NOTE

You can use user-defined key to activate Cube Strain. To assign the Cube Strain function to user-defined key, go to go to **Utility** > **Setup** > **SystemPreset** > **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **Cube Strain™**.

Selecting an Image

Figure 11-39 View Selection Window

1	Clipboard (Thumbnails)	**3**	View selection menu
2	Preview	**4**	Next icon

1 Select the desired cine image from the clipboard.
The selected cine images is displayed in the **Preview** field.

2 Select the corresponding view on the view selection menu to assign to the selected cine image.
You can choose one to three clips simultaneously according to your analysis group.

3 Click the Next icon ( ). The ***Sequence/M mode selection*** window appears.

4 Define the position of the R wave.
If the study has ECG data, the system automatically detects cardiac cycle, heart rate, and R wave position.

5 Click the Next icon ( ). The ***Contour*** window appears.

Contouring and Starting Analysis

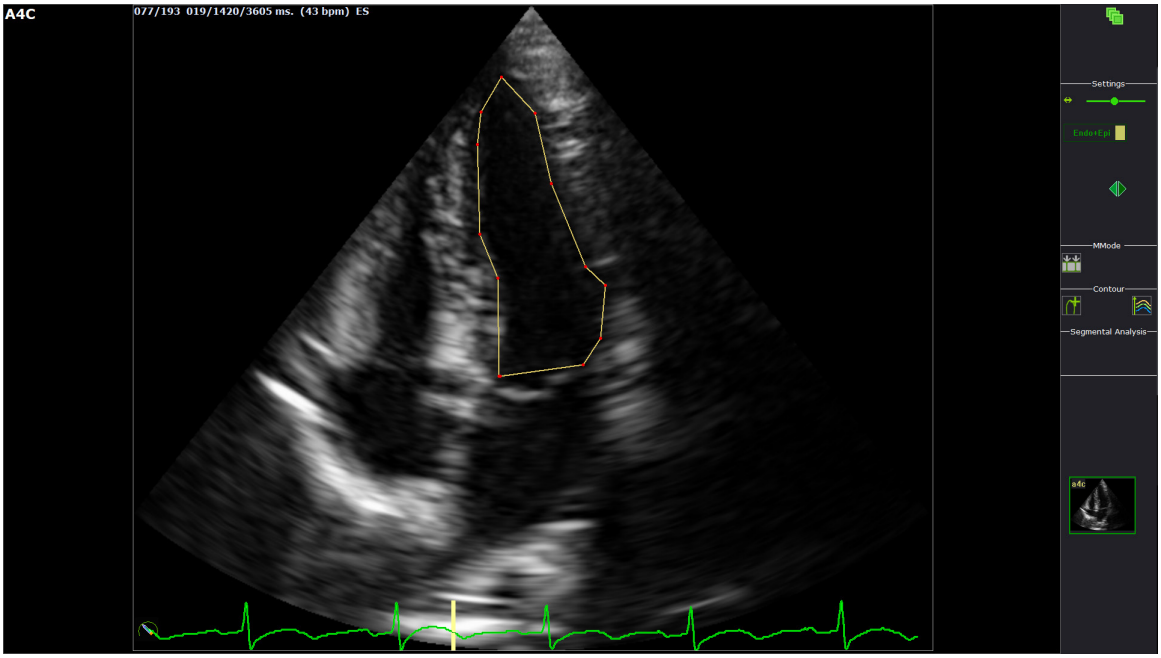
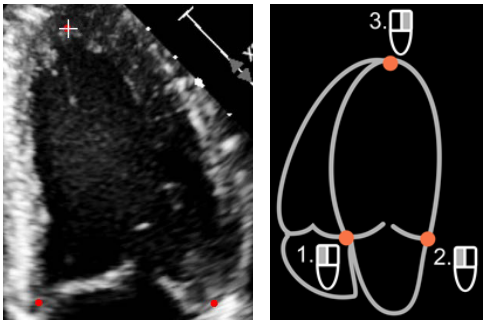


Figure 11-40 Contouring at ES Frame

1. Place landmarks at the endocardium in the end-systolic(ES) frame by using **[Trackball]**, and press the **[Set/Cur]** key.
   - Anterior annulus: Press the right **[Set/Cur]** key.
   - Posterior annulus: Press the right **[Set/Cur]** key.
   - Apex: Press the left **[Set/Cur]** key.



2. Click the Start Analysis icon ( ) to start the analysis. The end-diastolic(ED) frame appears.
3. If necessary, adjust the contour select.
   - To edit the trace for the end systole, click the Correct ES Border icon ( ). The new tracking will be initiated.
   - To edit the trace for the end diastole, click the Correct ED Border icon ( ). The contour of end systolic(ES) remains untouched.
4. If necessary, editing the contour by drag and drop the red points.
5. When tracing and editing contour are completed, click the Next icon ( ) to start calculation processes.
6. The ***Analysis*** window appears. A comprehensive array of data is displayed on the screen.

Cube Strain Analysis Window

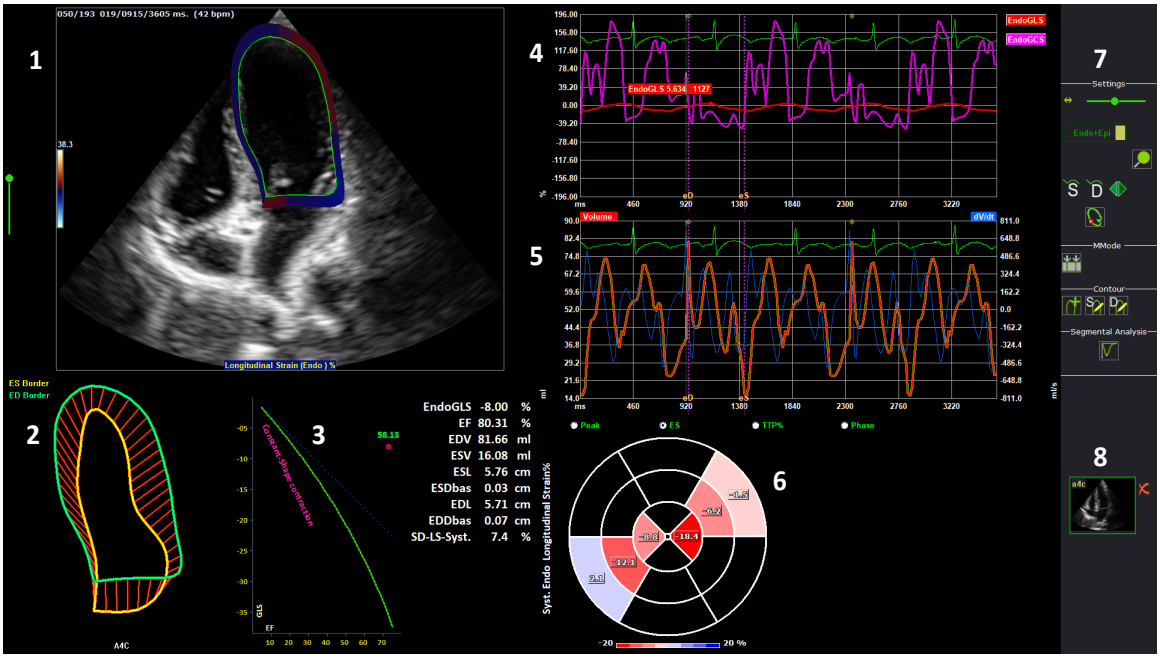


Figure 11-41 Cube Strain Analysis Window

1	Selected image(loop)	**5**	Volume gragh
2	3D contour	**6**	Bull's eye diagram
3	EF & Strain resulting gragh	**7**	Tool selection (Icons)
4	Longitudinal strain values	**8**	Image clipboard

The following table describes the optional icons that you can use for the Cube strain™ function.

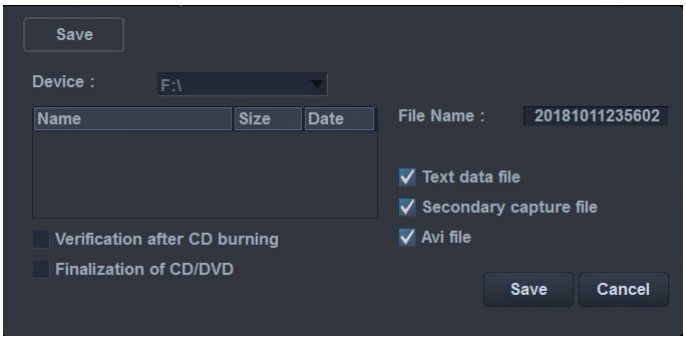
Icon	Name	Description
	Sequence/M mode selection	Open the Sequence/M mode selection screen.
	Start Analysis	Start the velocity strain analysis.
	New Trace	Start a new contour tracing.
	Correct ES Border	Edit trace for the end systole.
	Correct ED Border	Edit trace for the end diastole.
	Go To End Systole	Move the frame to "End Systole" on the 2D mode display.
	Go To End Diastole	Move the frame to "End Diastole" on the 2D mode display.
	Toggle contour/vector/ orbit line/2D mode	Select the icon until the display shows the desired function.
	Segmental Analysis	Go to Segmental Analysis page.
	Zoom in/Out	Zoom in or out the 2D mode display.
	Pictures Mirroring	Mirroring the 2D mode display.
	Image Select View	Return to Image Select View.
	Delete Selected Contour	Delete the selected contour.

Exporting the Result

You can save the data to an external file.

To export the result,

1. Insert your removable media to the media tray properly.
2. Select **Data Storage** on the touch screen. The dialog box appears.



3. Select the desired media from the ***Device*** drop-down list.
4. If you select **CD/DVD** from the ***Device*** drop-down list, you can use the following options:
   - **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.
   - **Finalization of CD/DVD**: Finalize the CD or DVD to prevent from further writing.
5. Select the data format.
   - **Text data file**: Eexport to a text file.
   - **Secondary capture file**: Creates a screen capture of the entire screen.
   - **Avi file**: Save the cine loop in AVI format
6. When you have finished, click **Save**.

Ending an Exam

1. When you have finished, select **Exit** on the touch screen.
   The ***Save*** window appears.
2. To save the results, click **Yes**.
   The scan screen appears and you can see thumbnail images on the clipboard.

Reviewing an Exam

To review a stored Cube Strain image,

1. Touch **E-View** on the touch screen.
2. Select the desired image.
   The selected image is highlighted.
3. Select **Review** on the touch screen.

Electrocardiograph (ECG)

ECG is an optional function that provides physiological trace by obtaining ECG signals. While scanning a cardiac image in M or Doppler mode, you can view the systolic and diastolic point on the ECG line of the display. This helps you study an image and perform a measurement correctly.

ECG Cable

The optional ECG cable consists of two different cables: One end is for the system cable, the other end is for the electrode cable. The electrode cable has a three-pronged electrode connector for connecting to your patient's body.

There are two types of electrode cables. Depending on your country, the colors and names defined on each cable connector may be different:

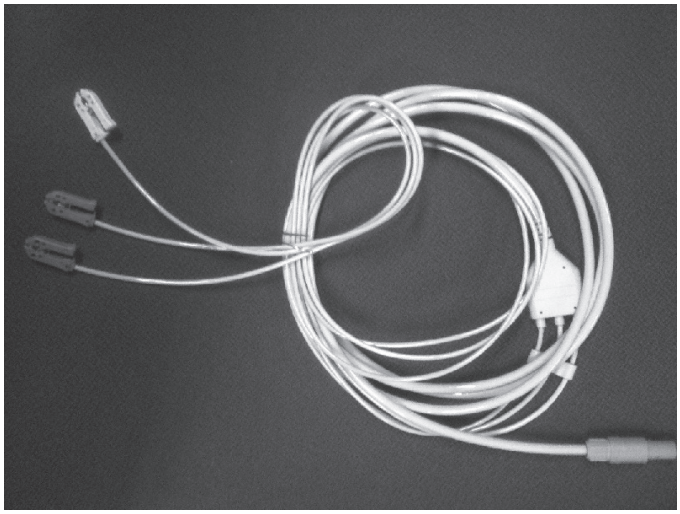


Table 11-3 ECG Color Code on Electrodes

Standard IEC(I) type European standard		AHA(A) type American standard		Position of the human body surface
Electrode Mark	Color Code	Electrode Mark	Color Code	
L	Yellow	LA	Black	Left arm
R	Red	RA	White	Right arm
F	Green	LL	Red	Left leg
N	Black	RL	Green	Right leg

ECG Trace Display

The scanned image is synchronized with the ECG trace.

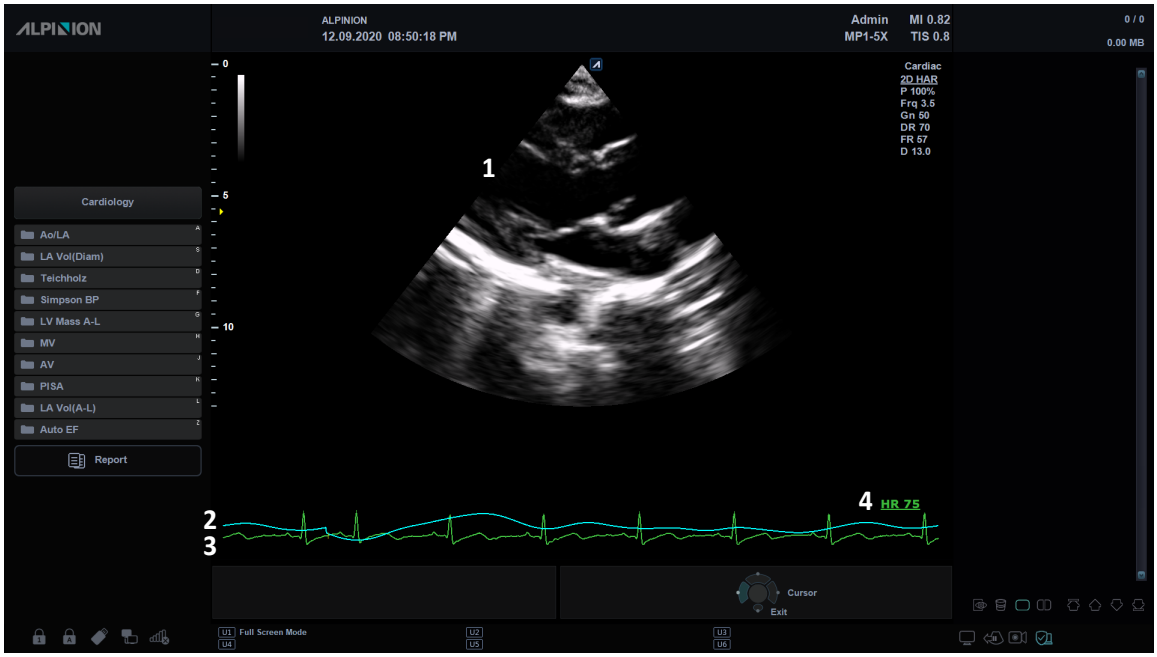


Figure 11-42 ECG Trace Display

1	Current view	**3**	ECG trace
2	Respiratory trace	**4**	Auto Heart Rate display

ECG/Respiration Optimization Controls

In ECG/Respiration mode, you can use the controls on the touch screen.

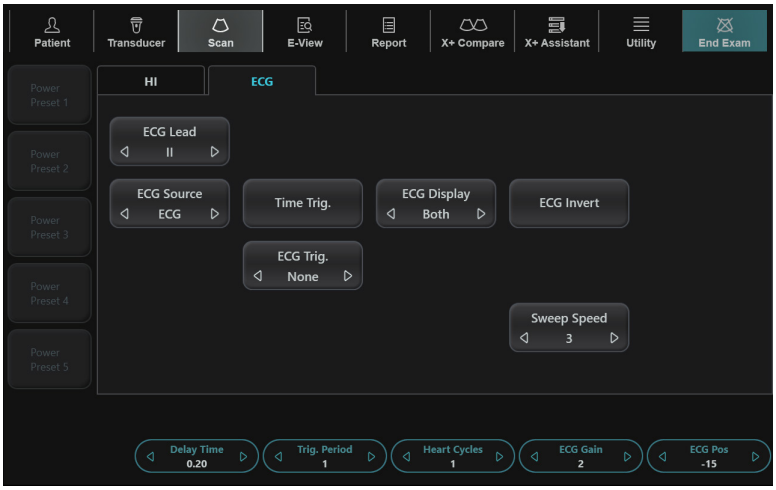


Figure 11-43 ECG/Respiration Mode Touch Screen

The following controls are available:

Control	Description
ECG Lead	Select the desired lead.
Source	Select the source of the waveform. You can adjust the amplitude or position of the selected waveform by using the soft keys.
Time Trig.	Set to show a frozen image each time you specified in **Delay Time**. If this option is activated, **ECG Trig**. is automatically set to none.
ECG Trig.	Select an active ECG trigger. You can activate both two triggers at the same time.
ECG Display	Hide or display the ECG and/or Respiratory trace.
ECG Invert	Invert the current ECG trace.
Sweep Speed	Change the speed of the ECG trace.
Delay Time	Set the time delay of the ECG trigger.
Trig. Period	Set the cycle number of the ECG trigger.
Heart Cycles	Select the number of heart cycles to store.
ECG Gain	Adjust the amplitude of the ECG/Respiratory trace.
ECG Pos	Adjust the vertical position of the ECG/Respiratory trace.

Setting the Applications for ECG Display

To set the application(s) to show or hide the ECG on the screen,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **ImagePreset** tab on the touch screen.
   The ***Image Preset*** screen appears.
4. Select **Application** on the touch screen.
5. Select the desired application check boxes under ***ECG Display*** configuration.
6. When you have finished, click **Save & Exit** to save the changes and return to scanning.

Activating ECG and/or Respiratory Trace

To activate ECG and/or respiratory trace(s),

1. Connect the ECG cable into the ECG port.
2. Hook up 3 stick-on electrodes (disposable) to each connector of the electrode cable until they click into place.
3. Attach the each connector of the electrode cable to the corresponding body parts.
4. Touch the **ECG** tab on the touch screen.
5. Adjust the ECG and/or respiratory tace(s).

Auto NT Measurements

Auto NT allows you to automatically measure the nuchal translucency thickness.

Auto NT Display

Figure 11-44 Auto NT Display

Auto NT Controls

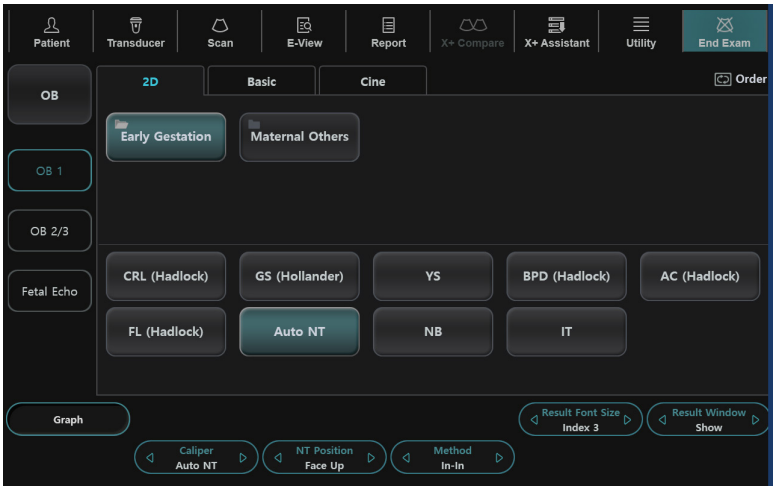


Figure 11-45 Auto NT Touch Screen

The following controls are available:

Parameter	Description
Caliper	Switch the caliper options between **Auto NT** and **Manual**. Manual NT is same as one distance (1 Distance) measurement.
NT Position	Select the fetal position (**Face Up** or **Face Down**).
Method	Select the NT calculation algorithm. • **In-In**: Measure between inner border and inner border. • **In-Mid**: Measure between inner border and middle border.

Performing an Auto NT Measurement

NOTE

Automatic Nuchal Translucency is not available through the factory default. To configure the Auto NT, go to **Utility** > **Setup** > **SystemPreset** > **Measurement** > **Labeled MEAS.** > **OB1** or **OB2/3** > **2D** > select **Auto NT** and click **Add**.

To measure the thickness of the nuchal translucency (NT) of the fetus automatically,

1. Acquire the magnified mid-sagittal view of the fetus by pressing the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **Auto NT** on the touch screen.
   The start point appears.

   NOTE

   According to the fetal position, you can select **Face Up** or **Face Down** by rotating the **NT Position** soft key.
4. Use **[Trackball]** to move the marker to the start point, and then press the **[Set]** key to fix the marker.
   The second point appears.
5. Use **[Trackball]** to move the marker at the diagonal edge of the NT ROI to the end point, and then press the **[Set]** key.
   The nuchal translucency diameter (**NT**) is shown on the ***Result*** window.
6. To complete the measurement, press the **[Set]** key.
   The measured value is fixed and summarized in the report.

NOTE

After the automatic measurement is completed, you can make one distance measurement manually, if necessary, to cross check the result.

Reviewing NT Results

The measurement results are summarized in the report.

To reivew the values of NT thinkness,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of NT thickness.

NOTE

The Auto NT value is shown with an apostrophe mark (') on the ***Report*** screen.

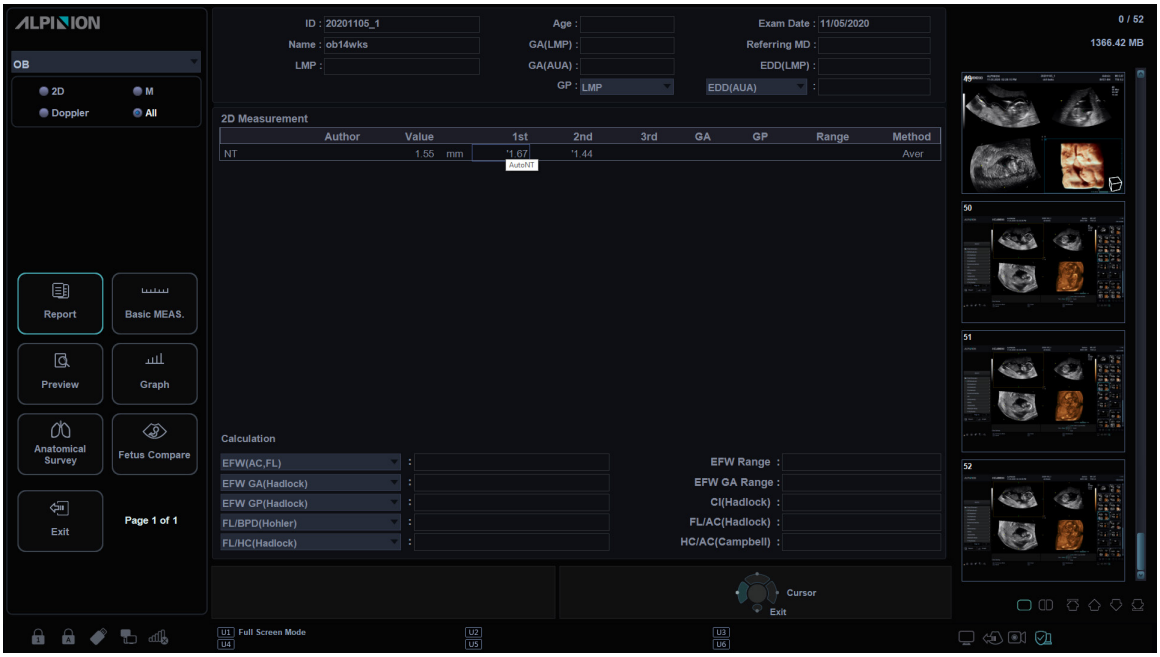


Figure 11-46 NT Results in Report

X+ Auto Biometry

X+ Auto Biometry allows you to automatically detect the Biparietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC), Femur Length (FL), and Hemerus Length (Humerus) by tracing the borders of specified OB measurements. The system measures the BPD, HC, AC, FL, and Humerus, which need to be confirm by the user or can be edited manually if necessary.

X+ Auto Biometry Display

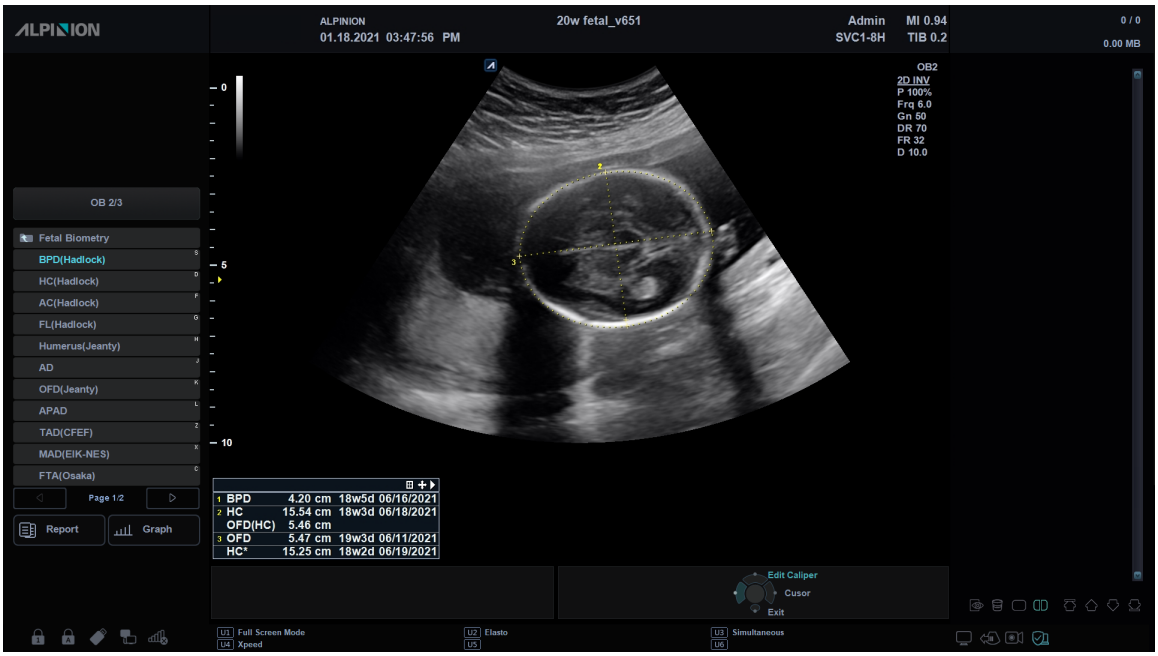


Figure 11-47 X+ Auto Biometry Display

Preparing to use X+ Auto Biometry

To set up X+ Auto Biometry,

1. Touch **Utility** on the touch screen.
2. Touch **Setup** on the touch screen.
3. Touch the **SystemPreset** tab on the touch screen.
   The ***System Preset*** screen appears.
4. Select **Measurement** on the touch screen.
5. Select **OB Meas.** on the touch screen.
6. Select the desired fetal biometry parameter check boxes under ***X+ Auto Biometry*** configuration.
7. When you have finished, click **Save & Exit** to save the changes and return to scanning.

Performing X+ Auto Biometry

To measure the fetal biometry automatically,

1. Select the **Fetal Biometry** folder on the touch screen.
2. Select the desired measurement (e.g. BPD, HC, AC, FL or Humerus).
   The trace is generated automatically on the display, and the calculation process starts.
3. The measured value is fixed, and the result is shown on the ***Result*** window.
   If the result is not correct, rotate the **Mode** soft key to select **Manual**, and then proceed with manual measurement.
4. To complete the measurement, press the **[Set]** key.
   The measured value is fixed and summarized in the report.

NOTE

If the system was not able to detect the anatomy automatically, the following message appears in the message area: "No valid Auto measurement was found. Please proceed with manual measurement."

Reviewing Fetal Biometry Results

The measurement results are summarized in the report.

To reivew the values of fetal biometry,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of fetal biometry.

X+ Auto Follicle

X+ Auto Follicle helps to detect follicles in an ovary and analyze follicular number and size.

X+ Auto Follicle Display

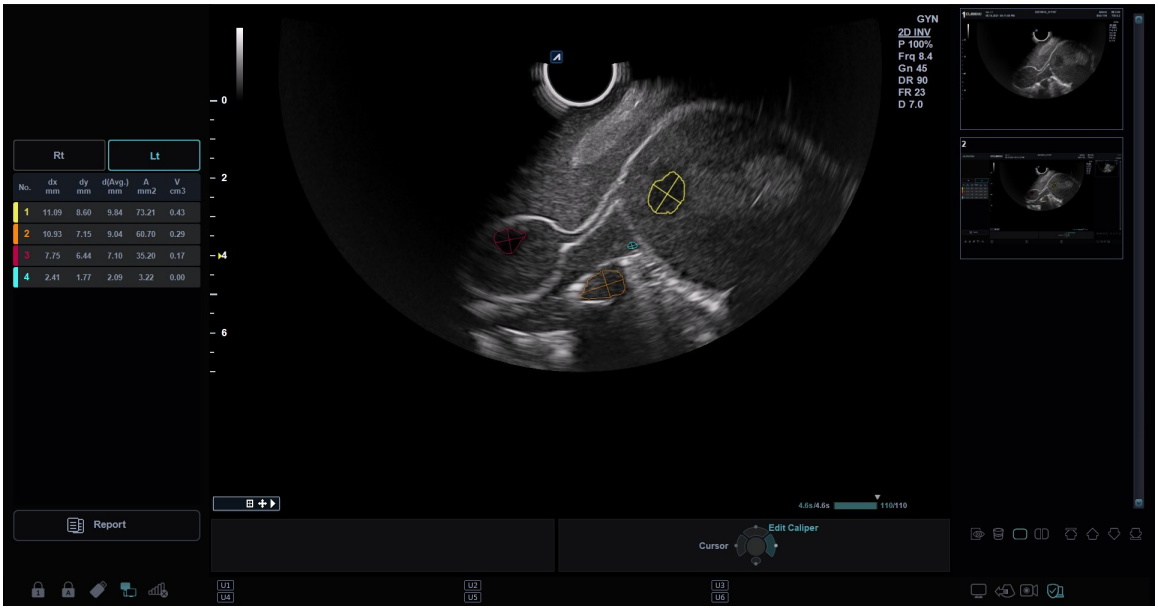


Figure 11-48 X+ Auto Follicle Display

Performing X+ Auto Follicle

To perform an Auto Follicle measurement,

1. Acquire 2D images of ovary follicles by pressing the **[Freeze]** key.

   NOTE

   Make sure the image quality is sufficient in order to detect the follicles within the ovary.

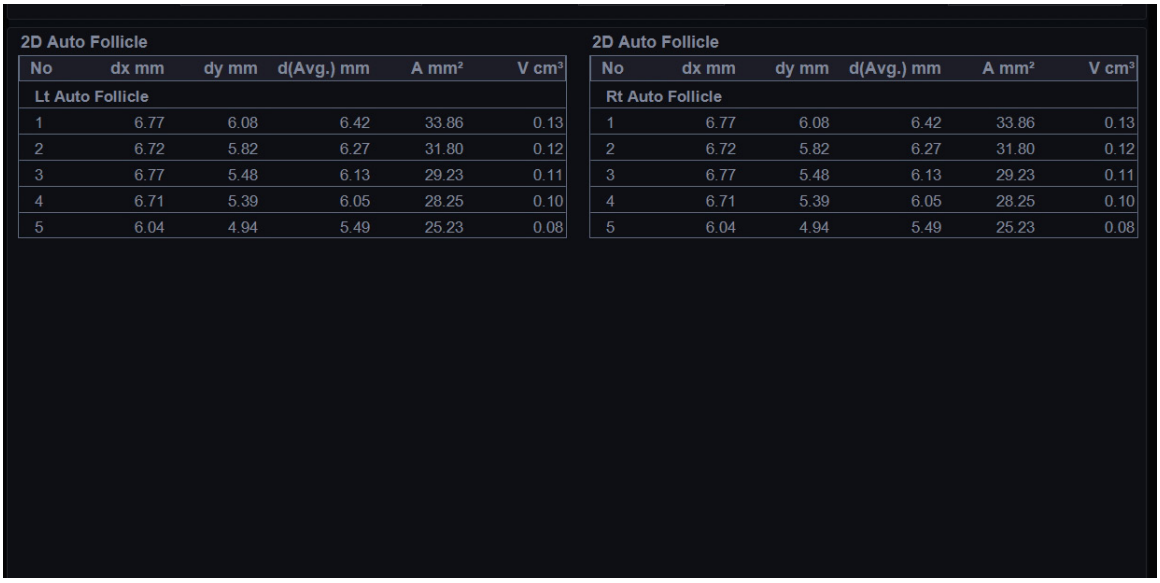
2. After acquiring the ovary follicle image, press the **[Measure]** key and select **Rt** (right) or **Lt** (left).
3. Press the **X+Auto Follicle** soft key.
4. The follicles that are detected from the image are traced automatically.
5. Select the follicle that is valid by **Set** key.
   Only selected follicle is color-coded and numbered, and the volume of selected follicles are shown on the screen.
6. To save the result, select **Report** on the touch screen.
   Save message box "Do you want to save data? (If there is existing data, it may be overwritten)" appears.
7. Select **Yes** to save the result.

Reviewing Follicle Measurement Results

The measurement results are summarized in the report.

To reivew the values of the follicle volume,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of the follicle volume.



2D Auto Follicle

No	dx mm	dy mm	d(Avg.) mm	A mm²	V cm³
Lt Auto Follicle					
1	6.77	6.08	6.42	33.86	0.13
2	6.72	5.82	6.27	31.80	0.12
3	6.77	5.48	6.13	29.23	0.11
4	6.71	5.39	6.05	28.25	0.10
5	6.04	4.94	5.49	25.23	0.08

2D Auto Follicle

No	dx mm	dy mm	d(Avg.) mm	A mm²	V cm³
Rt Auto Follicle					
1	6.77	6.08	6.42	33.86	0.13
2	6.72	5.82	6.27	31.80	0.12
3	6.77	5.48	6.13	29.23	0.11
4	6.71	5.39	6.05	28.25	0.10
5	6.04	4.94	5.49	25.23	0.08

Figure 11-49 Follicle Results in Report

Auto IMT Measurements

Auto IMT allows you to automatically measure the intima-media thickness of the wall in the carotid artery. When you place the start and end points in a line, the system shows the mean, max, standard deviation and quality index. The IMT measurement should be done on 2D mode images, not on Color mode images.

NOTE

The IMT measurement is available with linear transducers only.

For optimal recognition and results, it is recommended to follow the conditions below:

- Acquire a central plane through the vessel
- Frequency range between 7 MHz and 12 MHz
- Imaging depth between 30 mm and 45 mm
- Optimize the gain control
- Minimize artifacts in the lumen of the vessel

Auto IMT Display

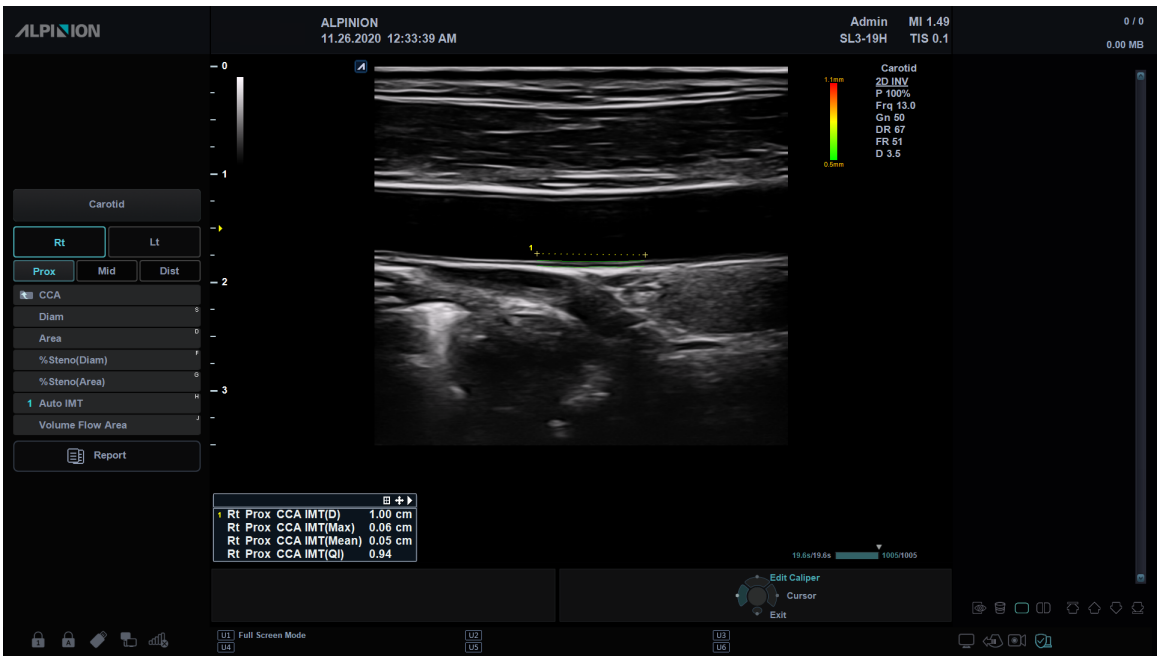


Figure 11-50 Auto IMT Display

Performing an IMT Measurement

To measure the IMT automatically,

1. Acquire a longitudinal view of the carotid artery by pressing the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **Auto IMT** on the touch screen. The start point appears.
4. From the point of the arterial branch about 5 mm away, draw a straight line of 10 mm by using **[Trackball]**. The end point appears.
5. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
6. The system calculates the measured value and shows the Mean (**Mean**), Max (**Max**), Distance (**D**), and Quality Index (**QI**) on the ***Result*** window.
7. Touch **Report** on the touch screen. The ***Report*** screen appears and you can view more measurement information including standard deviation.

NOTE

The Auto IMT values are shown with an apostrophe mark (') on the worksheet.

To measure the IMT manually,

– Select **Manual** by rotating the **Caliper** soft key, and make one distance measurement.

NOTE

After the automatic measurement is completed, you can make one distance measurement manually, if necessary, to cross check the result.

Reviewing IMT Results

The measurement results are summarized in the report.

To reivew the values of intima-media thickness,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of IMT thickness.

NOTE

The Auto IMT value is shown with an apostrophe mark (') on the worksheet.

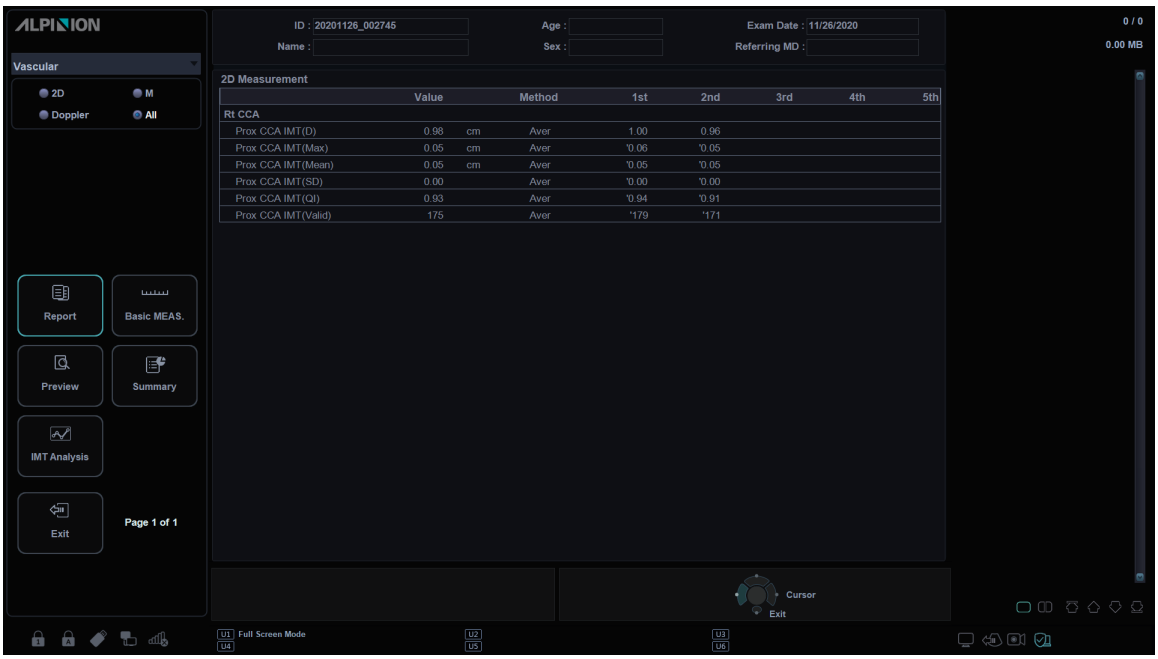


Figure 11-51 IMT Results in Report

IMT Analysis

To start the IMT anaysis,

– While viewing the vascular report, select **IMT Analysis** on the touch screen.

NOTE

The patient specific contents input on the IMT Analysis page are returned to the factory default settings after starting a new patient.

Figure 11-52 IMT Analysis Graph (AXA IMT)

To analyze an IMT measurement,

1. Select **IMT Analysis** on the touch screen.
   The IMT Analysis page displays.
2. Select the desired analysis graph (PARC IMT, AXA IMT, Framingham Score, Risk factore).
3. Set the measurement options by using the soft key.
   - **IMT Measurement**: CCA IMT, ICA IMT, Bulb IMT
   - **Side**: Rt, Lt
   - **Location**: Prox, Mid, Dist, Off

X+ Auto IVC

Automated inferior vena cava (IVC) measurements provide parameters for assessing fluid responsiveness in shock patients. The Collapsibility Index (CI) represents the collapsibility of the inferior vena cava and is calculated by the ratio between the maximal and minimal diameters of the IVC. The Distensibility Index (DI) represents the distensibility of the IVC in the artificialy ventilated patient.

X+ Auto IVC is an optional feature. For using this feature, you need an additional request to your local agent.

Auto IVC Display

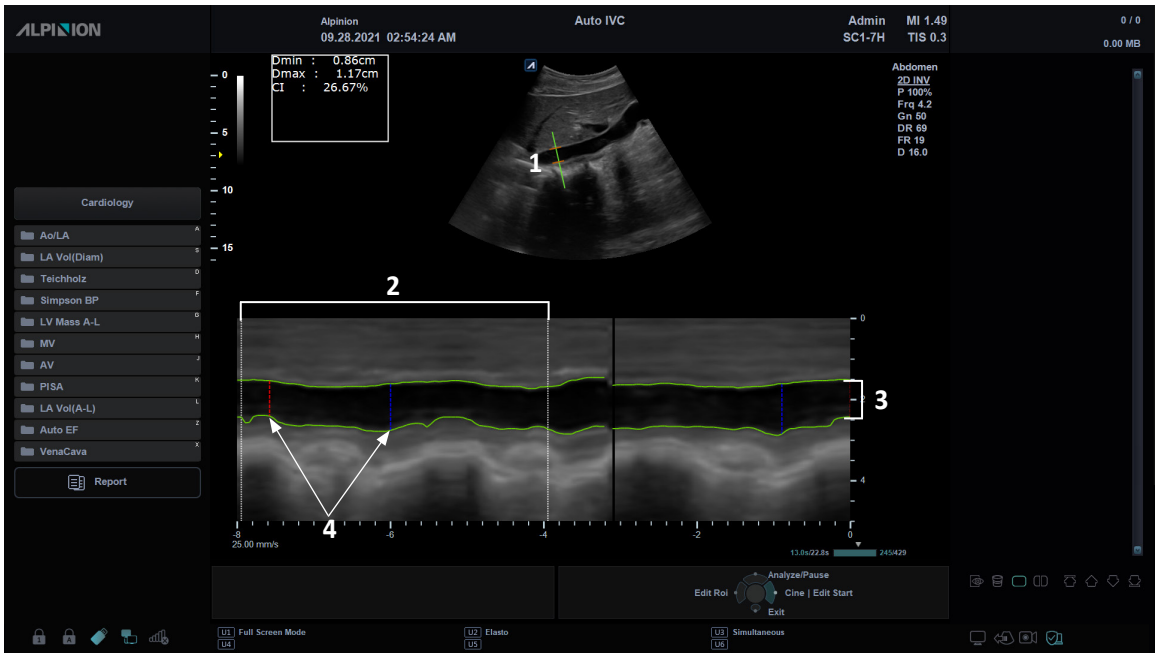


Figure 11-53 Auto IVC Display

1	Anatomical M-Mode cursor	**3**	IVC border trace
2	Calculation Time Interval (CTI) zone	**4**	Dmax and Dmin within CTI

Auto IVC Controls

Figure 11-54 Auto IVC Touch Screen

The following controls are available:

Parameter	Description
EditROI	Edit the position of the cursor line.
Analyze/Pause	Start/Stop measuring the IVC.
Add Report	Save the measurement result. You can see the results in the worksheet.
Run/Stop	Start/Stop the cine loop review.
Exit	Exit Auto IVC.
Cine Range	Specify time to store cine.
Cycle(s)	Adjust the time intervals for displaying CTI markers.
Sweep	Change the speed at which the timeline is swept.
Type	Select the patient's type (**Spontanuous** or **Mechanical**).
Edit Start Frame	Define new beginning point of a cine loop.

Performing an Auto IVC Measurement

To measure the Inferior Vena Cava (IVC) automatically,

1. Connect the appropriate Auto IVC-compatible transducer.
2. Select **Transducer** on the touch screen.
   The dialog box for transducer and application selection appears.
3. Select the desired transducer, application and preset on the touch screen.
4. Click **Exit** to complete the transducer selection.
5. On the control panel, press the **[2D]** key to activate 2D mode.
6. Scan the patient in the subcostal position to view the IVC on the 2D-mode screen.
7. Acquire a IVC view by pressing the **[Freeze]** key on the control panel.
8. Select **AutoIVC** on the touch screen. The Auto IVC screen appears.
   - The system displays 2D mode along with the M-mode timeline.
   - The cursor line appears over the IVC.
   - The cross-section of the IVC is traced along the M-mode timeline.
   - CTI markers appear as red /blue vertical lines at 4.0 sec. intervals.
9. If the patient is ventilated, select **Mechanical** by rotating the **Type** soft key.
   The measurement is switched from CI to DI.
   - **Spontenuous**: For patients with spontaneous breathing.
   - **Mechanical**: For patients with mechanical ventilation.
10. View the cursor line appearing and stabilizing automatically on the IVC. If the cursor line has not been positioned correctly, select **EditROI** and move the cursor line to the desired position by using **[Trackball]**.
11. If necessary, adjust the angle of the cursor line by rotating the **[Angle]** key on the control panel.
12. If necessary, adjust the sweep speed and cycles by using each soft key.
13. Select **Analyze/Pause** to start measuring the IVC.
14. The system highlights the selected CTI on the M-mode timeline and display the maximum diameter measured frame in the 2D-mode screen. The results of the measurements appear in the result box, on the left upper side of the screen.
15. To save the result, select **Add Report** on the touch screen. The results are shown on the ***Report*** screen.

    NOTE

    After the automatic measurement is completed, you need to approve the measurement by visual inspection before storing the results into the worksheet database.
16. To exit Auto IVC, select **Exit** on the touch screen.

Reviewing IVC Results

The measurement results are summarized in the report.

To reivew the values of Inferior Vena Cava,

– Touch **Report** on the touch screen. The ***Report*** screen appears and you can see the values of Inferior Vena Cava.

12

Transducer and Biopsy

This chapter describes the transducer overview and biopsy preparations.

Transducer

The ultrasound system uses transducers to obtain graphic data of the human body and then displays it on the screen. Always use application-specific transducers in order to obtain the best quality images. It is also important to use a preset that is best suited to the particular organ being scanned.

Transducer Components

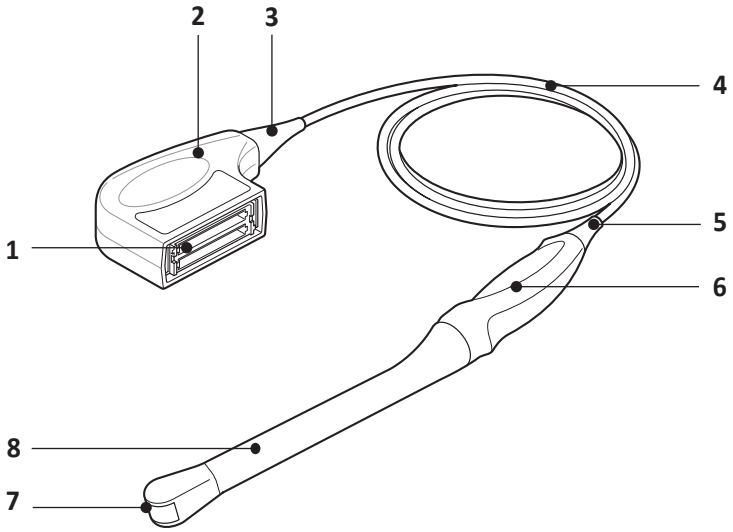


Figure 12-1 Transducer Components

No.	Component	No.	Component
1	Connector electrical contacts	**5**	Transducer strain relief
2	Connector housing	**6**	Transducer handle
3	Connector strain relief	**7**	Transducer lens
4	Transducer cable	**8**	Transducer neck

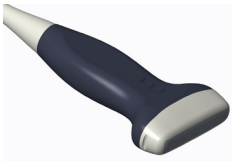
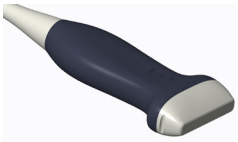
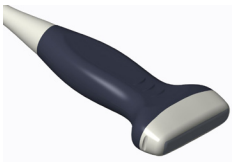
Compatible Transducers

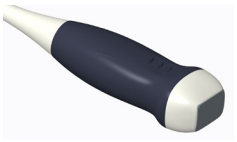
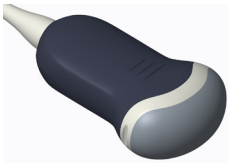
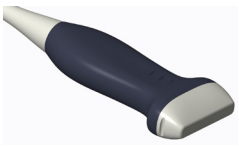
The following transducers are compatible with the X-CUBE 70 ultrasound system:

NOTE

- The user manual refers to transducers that can be connected to the system. It might be possible that some transducers or applications are NOT available in certain countries.
- Some biopsy guides may not be available in certain countries.

Table 12-1 Transducer application and features

Transducer	Type	Application	Additional Features
 L3-12X	**Linear**	MSK, Vascular, Small Parts, Breast, EM	• L3-12X Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Needle Vision™ Plus • Strain Elastography
 SL3-19H	**Linear**	MSK, Vascular, Small Parts, Breast, EM	• L3-12 Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Needle Vision™ Plus • Strain Elastography
 SL3-19X	**Linear**	MSK, Vascular, Small Parts, Breast, EM	• L3-12X Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Needle Vision™ Plus • Strain Elastography
 L10-25H	**Linear**	MSK, Vascular, Small Parts, EM	• Panoramic Imaging • Needle Vision™ Plus • Strain Elastography
 SC1-7H	**Convex**	Abdomen, GYN, OB, Urology, MSK, EM	• SC1-6 Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Contrast Enhanced Imaging (CEUS) • Point Shear Wave Elastography
 SC2-11H	**Convex**	Abdomen, EM	

Transducer	Type	Application	Additional Features
 MP1-5X	**Sector Phased**	Abdomen, Cardiology, EM, TCD	• Stress Echo • Cube Strain™
 EC2-11H	**Endocavity**	GYN, OB, Urology, EM	• EV2-11H Reusable BiopsyStarter Kit (May not be available in all countries.) • Strain Elastography
 EV2-11H	**Endocavity**	GYN, OB, Urology, EM	• EV2-11H Reusable Biopsy Starter Kit (May not be available in all countries.) • Strain Elastography
 SVC1-8H	**Volume Convex**	Abdomen, GYN, OB, EM	• 3D/4D imaging • Panoramic Imaging
 VE3-10H	**Volume Endocavity**	GYN, OB, Urology, EM	• VE3-10H Disposable Biopsy Starter Kit • VE3-10H Reusable Biopsy Starter Kit • 3D/4D imaging • Strain Elastography
 SP3-8T	**Sector Phased**	Abdomen, Cardiology, EM	• Stress Echo • Cube Strain™
 SC2-9H	**Convex**	EM, OB	• Panoramic Imaging
 L3-15H	**Linear**	MSK, Vascular, Small Parts, Breast, EM	• L3-12 Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Needle Vision™ Plus • Strain Elastography

Transducer	Type	Application	Additional Features
 L3-8H	**Linear**	EM, Vascular, Breast	• L3-12 Biopsy Starter Kit • Multi-angle • Panoramic Imaging • Needle Vision™ Plus • Strain Elastography
 CW5.0	**Pencil Doppler**	Cardiology	
 CW2.0	**Pencil Doppler**	Cardiology	
 CW8.0	**Pencil Doppler**	Cardiology	

CAUTION

Transducers for transvaginal and transrectal applications require special handling. Transvaginal or transrectal examinations and transducer insertions should be performed only by personnel with adequate training.

Transducer- specific Features

Table 12-1 Transducer features

Feature / Model	Harmonics (THI)	Speckle Reduction Imaging (SRI)	Multi-beam	Biopsy	4D	Easy 3D	Virtual Convex	Spatial Compounding
L3-12X	o	o	o	o	x	x	o	o
L10-25H	o	o	o	x	x	x	o	o
SL3-19H	o	o	o	o	x	x	o	o
SL3-19X	o	o	o	o	x	x	o	o
SC1-7H	o	o	o	o	x	x	x	o
SC2-11H	o	o	o	x	x	x	x	o
MP1-5X	o	o	o	x	x	x	x	x
EV2-11H	o	o	o	o	x	x	x	o
EC2-11H	o	o	o	o	x	x	x	o
SVC1-8H	o	o	o	x	o	o	x	o
VE3-10H	o	o	o	o	o	o	x	o
CW2.0	x	x	x	x	x	x	x	x
CW5.0	x	x	x	x	x	x	x	x
CW8.0	x	x	x	x	x	x	x	x
SC2-9H	o	o	o	x	x	x	x	o
SP3-8T	o	o	o	x	x	x	x	x
L3-8H	o	o	o	o	x	x	o	o
L3-15H	o	o	o	o	x	x	o	o

Biopsy

A biopsy is a medical procedure that obtains a tissue sample of a very specific area of the body for diagnostic testing. The transducer and the biopsy kit are used together when conducting a biopsy with the ultrasound system.

Using ultrasound for needle placement assures accuracy of the cell retrieval by verifying the exact site of biopsy and minimizes the risk to the patient.

Biopsy Kit Components

The biopsy kit components vary depending on the transducer type. The components are as following:

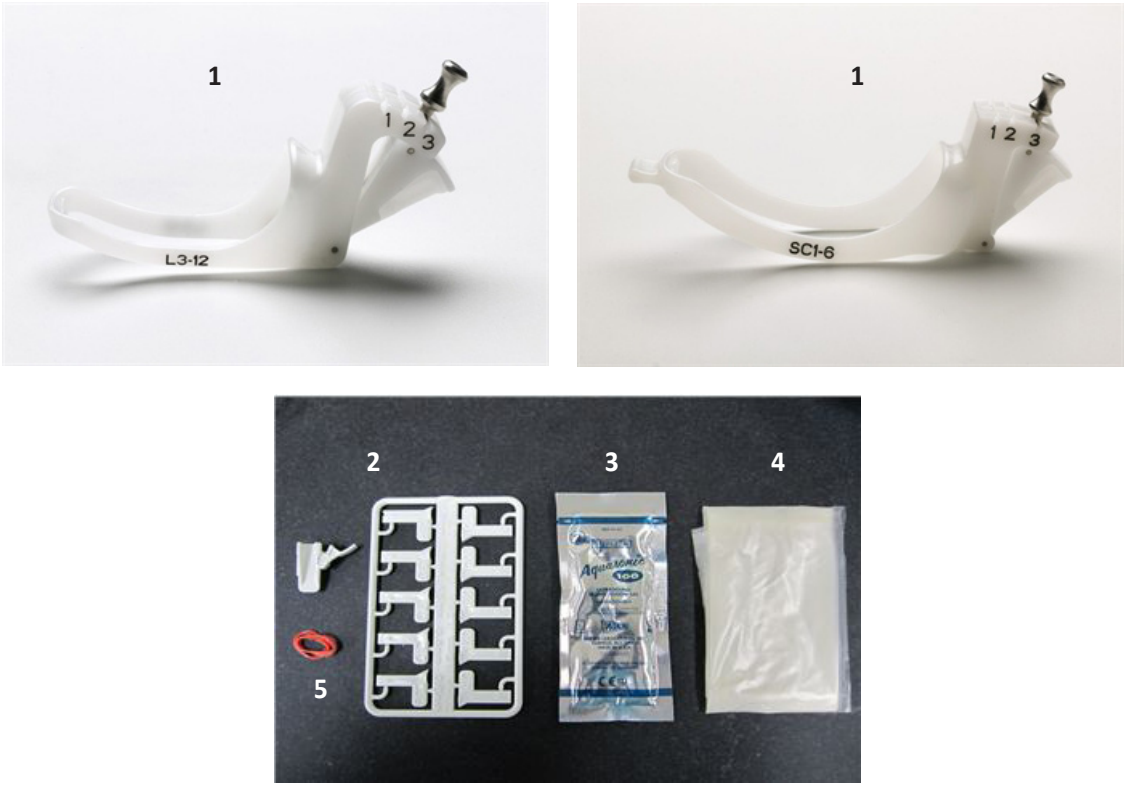


Figure 12-2 Biopsy Starter Kit

No.	Component	No.	Component
1	Needle guide bracket	**4**	Sheath
2	Needle guide & Needle barrel	**5**	Rubber band
3	Gel		

NOTE

The biopsy starter kit can be purchased from ALPINION MEDICAL SYSTEMS.

Precautions Concerning the Use of Biopsy Procedure

WARNING

Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error. Biopsy guidezones are intended to assist the user in determining optimal transducer placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.

WARNING

Biopsy procedures should not be used for In vitro fertilization (IVF), Chronic villus sampling (CVS), and Percutaneous umbilical blood sampling (PUBS).

CAUTION

The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury.

CAUTION

The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.

- Follow the transducer cleaning and disinfection procedures and precautions to properly prepare the transducer.
- Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
- Use protective barriers such as gloves and transducer sheaths.
- After use, follow proper procedures for decontamination, cleaning, and waste disposal.

Failure to follow these instructions could lead to exposure to infectious agents.

CAUTION

Improper cleaning methods and the use of certain cleaning and disinfecting agents may cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. For details, "Transducer Safety" on page 2-11.

CAUTION

A biopsy must only be performed by physicians with adequate experiences under all circumstances the necessary safety precautions and sterility measures have to be respected.

The Biopsy Guidezone Display

WARNING

- Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error.
- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy procedure.

The biopsy guidezone represents a path of the needle. Colored markers in each dotted guideline show the actual increments in the area of the anatomy.

- Yellow marker is represented by 1 cm increment of the needle depth.
- Blue marker is represented by 5 cm increment of the needle depth.

NOTE

When **Enable 0.5cm markers** in Image Preset is selected, each yellow maker represents 0.5 increment.

The display should be carefully monitored during a biopsy for any needle deviation from the center line and the guidezone. The biopsy guidezone appears along with image adjustments such as image invert, rotation, zoom, and depth change.

Figure 12-3 Biopsy Guidezone

Preparing the Biopsy Guide Attachment

The each transducer (convex, sector, and linear transducers) has the optional biopsy guide attachment. The guide consists of a non-disposable bracket to attach to the transducer, disposable needle clip to attach to the bracket, sheath, coupling gel, and disposable needle guide.

The disposable needle guides are available for a variety of needle sizes.

The bracket is packed non-sterile and is reusable. To avoid possible patient contamination, ensure bracket is properly cleaned, disinfected, or sterilized before each use.

The disposable components are packed sterile and are single-use only. Do not use if expiration date has passed.

NOTE

Please refer to the manufacturer's instructions included in the biopsy kit.

Assembling the Multi-angle Biopsy Guide

WARNING

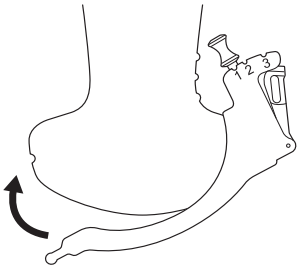
DO NOT attempt to use the biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood.

NOTE

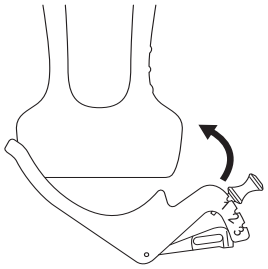
For detailed information on a biopsy guide, please contact the manufacturer(CIVCO) of the biopsy guide.

1. Scan the patient and identify the target for biopsy. Move the transducer to locate the target to the center of the image. Enable the system biopsy guidezone and try guidezone angles 1 to 3 to decide the best angle setting for the needle path.
2. Prepare the appropriate biopsy guide bracket by matching the transducer label on the bracket with the transducer to be used.
3. Orient the guide bracket toward the orientation mark of the transducer, and then attach the bracket by sliding it over the end of the transducer until it clicks in place.

Convex transducer



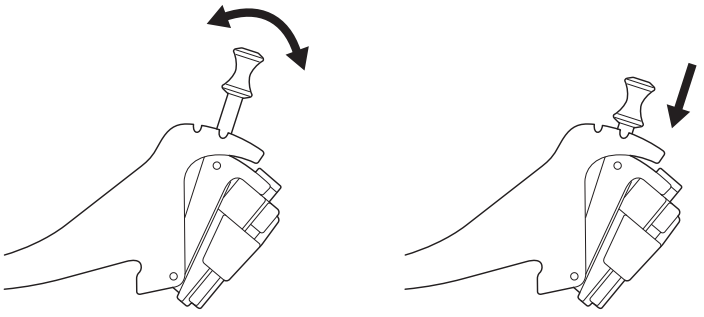
Linear transducer



NOTE

Depending on the transducer you are using, attaching the guide bracket may be different. Refer to the manufacturer’s instruction included in the biopsy kit.

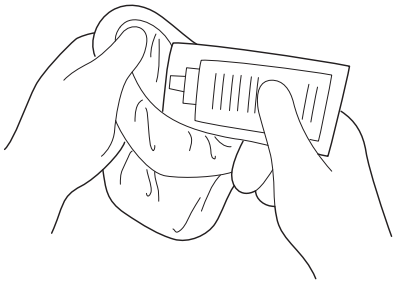
4 Pull up the knob to release to move the needle guide attachment. Align the knob with a desired angle position (angle 1, 2, or 3) and push the knob down to secure the angle position.



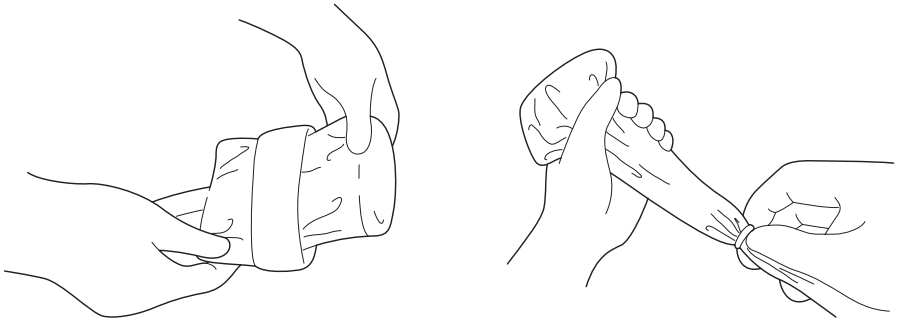
CAUTION

Hold the bracket in place on the transducer when pushing the knob to secure the angle position of the needle guide attachment. Excessive force may cause the bracket to release from the transducer.

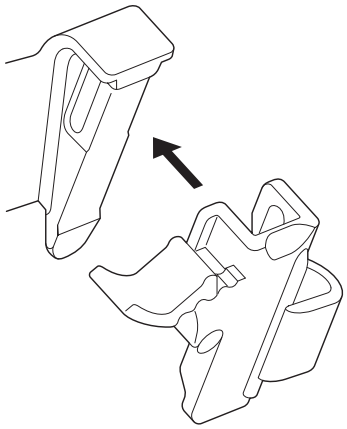
5 Place the ultrasound gel inside a sanitary sheath.



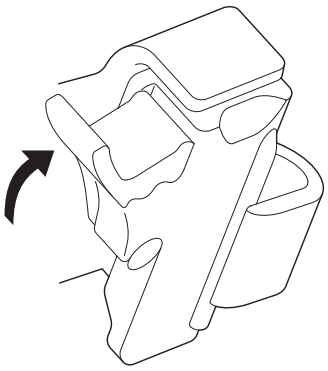
6 Cover the transducer and biopsy bracket with the sanitary sheath. Use the rubber bands to tighten the sheath.



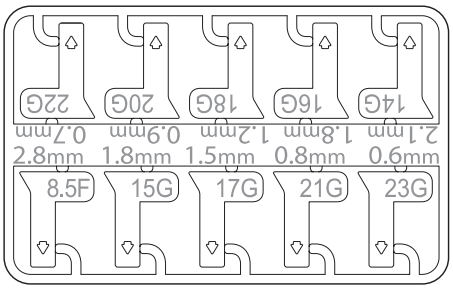
7 Snap the needle guide onto the biopsy guide bracket.



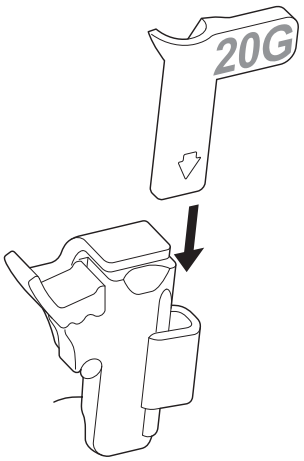
8 Push the locking mechanism towards the bracket to secure the lock. Make sure that the needle guide is firmly attached to the bracket.



9 Select a desired size of the needle barrel from the plastic tree. Twist the needle barrel back and forth to remove it.



10 Place the needle barrel into the needle guide until it clicks into place.



CAUTION

Before performing a biopsy, ensure that all guide parts are seated properly.

Assembling the Single-angle Biopsy Guide

WARNING

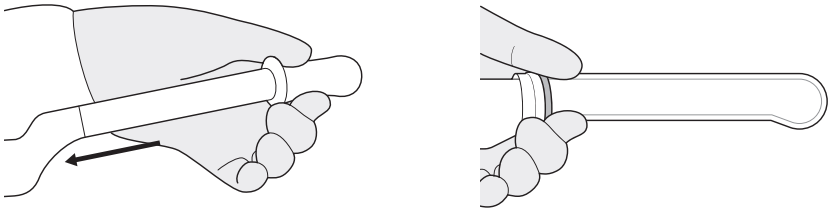
DO NOT attempt to use the needle guide until the manufacturer's instructions, provided with the needle guide in the kit, have been read and thoroughly understood.

NOTE

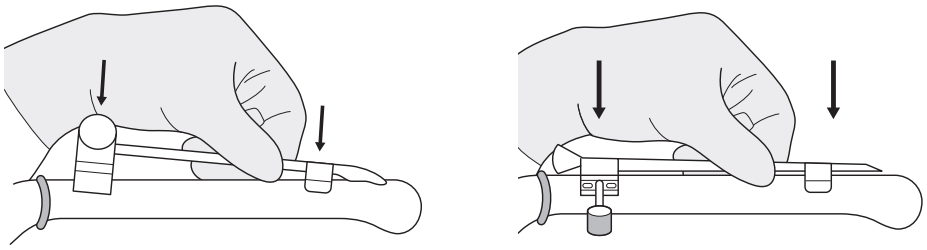
For detailed information on a biopsy guide, please contact the manufacturer(Aspen Surgical Products, Inc.) of the biopsy guide.

Reusable biopsy guide (Metal)

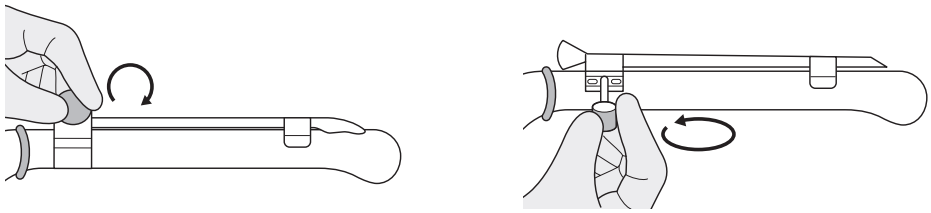
1 Place the ultrasound gel inside the sheath and/or on the transducer scanning surface. Place the transducer sheath over the transducer and secure the sheath with bands.



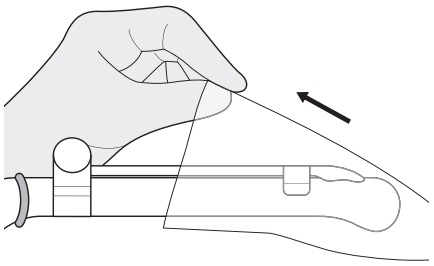
2 Place the needle guide (styles vary) onto the transducer as shown.



3 Make sure the needle guide is securely attached to the transducer.

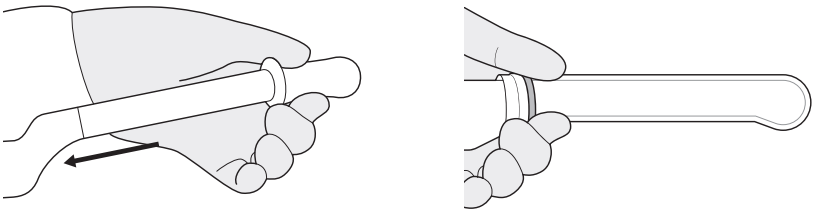


4 Place the second sheath over the transducer and needle guide. Secure the sheath with bands.

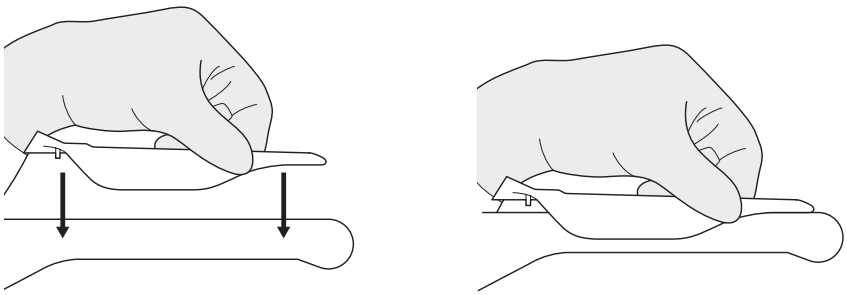


Disposable biopsy guide (Plastic)

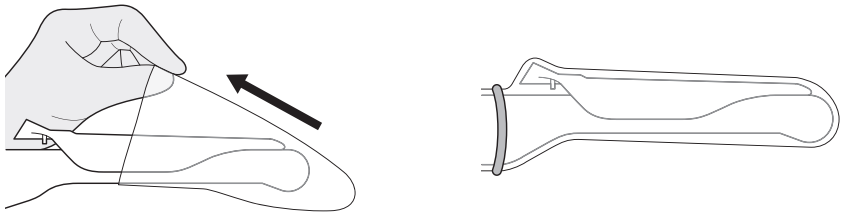
1 Place the ultrasound gel inside the sheath and/or on the transducer scanning surface.
Place the transducer sheath over the transducer and secure the sheath with bands.



2 Place the needle guide onto the transducer and snap into position.
Make sure the needle guide is securely attached to the transducer.



3 Place the second sheath over the transducer and needle guide. Secure the sheath with bands.



Verifying the Biopsy Needle Path

WARNING

- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy procedure.
- The path of the needle must display within the guideline. Do not use a needle guide if the path of the needle is not accurately displayed by the on-screen guidelines.

Before performing any patient procedure using a biopsy guide, you must verify that the path of the needle is accurately displayed by the on-screen guidelines.

1. Attach the biopsy guide to the transducer.
2. Set the system to the depth of the intended puncture procedure.
3. Immerse the head of the transducer into the water and insert the needle into the needle guide.
4. Verify that the path of the needle displays according to the guidelines shown on the screen.
5. If the needle image is out of the guideline, check the needle guide or the needle guide bracket.

Performing the Biopsy Procedure

WARNING

- Biopsy procedure must be performed on a live image to avoid positioning error.
- Before starting a biopsy, make sure that all patient information is entered and the study is saved.

CAUTION

- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during an out-of-plane biopsy procedure.
- When performing an out-of-plane biopsy, i.e. without a biopsy guide, it is the user's responsibility to use appropriate equipment. Ensure that the needle (especially the needle tip) is always visible in the ultrasound image during the whole biopsy procedure.
- Always only use basic modes when performing an out-of-plane biopsy.

When the biopsy guide assembly is completed, perform the following biopsy procedure.

1. Scan an image. When you find a target image, place the target in the middle of the guidezone.

   NOTE

   Enabling Color Flow mode would allow for visualization of vascular structure around the area to take a biopsy.

2. When the target image is prepared, press the **[Biopsy]** key once, twice, or three times on the QWERTY keyboard that corresponds to the selected angle. The biopsy guidezone appears on the display.

   – Press the key once for angle 1.

   – Press the key twice for angle 2.

   – Press the key three times for angle 3.

CAUTION

Ensure that the selected angle on the biopsy guide corresponds to the selected guide line of the guidezone.

3 Place the needle in the guide line between the needle barrel and the needle guide. Direct it into the area of interest.

CAUTION

Always use a straight, new and sterile needle for each biopsy procedure.

NOTE

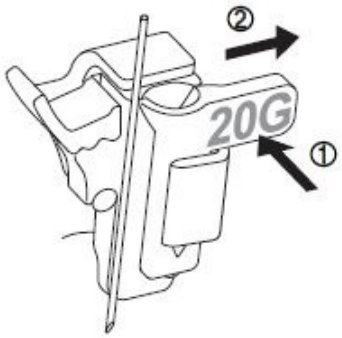
To configure the biopsy guidezone settings, press the **[Image Preset]** key and go to **General**.

Releasing the Needle

After performing a biopsy, release the needle from a transducer and an assembly by following the procedure.

1 Push the knob portion of the sleeve in the direction of the arrow ①.
The needle is released from the assembly.

2 Push the transducer and assembly in the direction of the arrow ② to remove the needle.



Transducer Accessories

Transducer Sheath

Transducer sheaths help to prevent contamination from blood or body fluids during the examination, operation, or biopsy. Sheaths should be used for clinical application that may indicate the need for such care, and during endocavity scanning; during biopsy or puncture procedures; or when scanning patients with open wounds.

WARNING

- Always keep sheaths in a sterile state.
- Sheaths are disposable. Do not reuse them.
- If sheaths are torn or soiled after use, clean and disinfect the transducer.
- Some sheaths contain natural rubber latex and talc, which can cause allergic reactions in some individuals.

CAUTION

- Make sure that you do not use an expired sheath.
- Using pre-lubricated condoms as a sheath might damage the transducer.

Applying the sheath

WARNING

After placing the sheath over the transducer, visually inspect the sheath to ensure there are no defects. Do not use the sheath if it has any holes or tears.

1. Remove the packaging and unfold the transducer sheath.
2. Before applying any ultrasound gel to the sheath, remove any powder in the sheath by rinsing with water.
3. Apply a water-based ultrasound gel to the inside of the sheath and onto the face of the transducer.
4. Hold the transducer by the cable relief and unroll the sheath onto the transducer.
   If necessary, cover the transducer cable as well.
5. Pull the transducer sheath tightly over the face of the transducer to remove wrinkles.
6. Secure the sheath to the transducer housing or cable relief with the adhesive tapes or elastic bands provided.
   If necessary, secure the sheath to the transducer and the transducer cable.

Disposing the sheath

While wearing protective gloves, remove the transducer sheath from the transducer and dispose of it according to medical regulations for biohazardous waste.

Ultrasound Gel

The ultrasound gel helps to transfer the sound waves into the body during the examination.

Using appropriate ultrasound gels may cause damage to the transducer. To prevent transducer damage, only use ultrasound gels approved or recommended by ALPINION. Refer to Resource on website (http://http://www.alpinion.com) for the latest list of compatible ultraound gels.

WARNING

- Do not use mineral oil, lubricant oil, oil-based lotions, or other non-approved materials, as they may cause damage to the transducer. Using damaged or defective transducer could cause electric shock in users or patients.
- Do not use ultrasound gels that contain the following contents:
  - Oils such as mineral oil, cooking oil, gasoline, solvents, rust inhibitors, lanolin, paraffin-based grease, ester and excessive silicon-based release agent
  - Alcohols such as acetone, methanol, plasticizer (dioctylphtalate) or denatured alcohols
  - Glacial acetic acid and iodine
  - All types of lotions or gels that contain aromatic substances

13

Care and Maintenance

This chapter describes the followings:

System Care and Maintenance

It is the responsibility of the user to verify that the ultrasound system is safe for diagnostic operation on a daily basis. Each day, prior to using the system, perform each of the steps in the daily checklist.

All exterior parts of the system, including the control panel, keyboard, and transducers, should be cleaned and/or disinfected as necessary or between uses. Clean each component to remove any surface particles. Disinfect components to kill vegetative organisms and viruses.

The air filter on the ultrasound system must be cleaned regularly to maintain proper system cooling. Remove and check the air filter weekly, and clean as needed.

CAUTION

- The system does not contain any operator serviceable internal components. Ensure that unauthorized personnel do not tamper with the unit.
- When defects or malfunctions occur, do not operate the system until the problems are resolved. Contact your local service representative.

Expected Service Life Description

The expected service life for the X-CUBE 70 system and transducers is identified in this table:

Equipment / Accessory	Expected Service Life
X-CUBE 70 system	The expected service life for the X-CUBE 70 system is at least seven (7) years from the manufacturing date under the provision of regular maintenance by authorized service personnel.
X-CUBE 70 transducers	The expected service life for the X-CUBE 70 transducers meets or exceeds five (5) years from the date the transducer is placed in service, under the provision that the customer follows the care instructions provided on the X-CUBE 70 User Manual.

Daily Checklist

Perform the following each day before using the ultrasound system:

- Visually inspect all transducers. Do not use a transducer which has a cracked, punctured, or discolored casing or frayed cable.
- Visually inspect all power cords. Do not turn on the power if a cord is frayed or split, or shows signs of wear. If your system's power cord is frayed or split, or shows signs of wear, contact your ALPINION service representative for power cord replacement.
- Visually inspect that the trackball and other controls on the control panel to make sure that they are clean and free from gel or other contaminants.
- Visually inspect the ECG connector and cables. Do not use the ECG connector and cables if they are damaged.

WARNING

To avoid electrical shock, you must visually inspect the transducer prior to use. Do not use the transducer that has a cracked, punctured, or discolored casing or a frayed cable.

Monthly Checklist

To inspect the system, examine the following on a monthly basis.

- Connectors on cables for any mechanical defects
- Entire length of electrical and power cables for cuts or abrasions
- Control panel and keyboard for defects
- Casters for proper locking operation

NOTE

To maintain the safety and functionality of the ultrasound system, maintenance must be performed every 12 months. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations. Refer to the service manual for the electrical leakage test.

WARNING

When the LED lamp needs to be replaced, contact the ALPINION service representative.

CAUTION

To avoid electrical shock hazard, do not remove panels or covers from the console. This service must be performed by qualified service personnel. Failure to do so could cause a serious injury.

Weekly Maintenance

The system requires weekly care and maintenance to function safely and properly. Clean the following:

- Monitor
- Control panel
- Footswitch

Failure to perform required maintenance may result in unnecessary service calls.

Cleaning the System

Prior to cleaning any part of the system:

– Turn off the system power. If possible, disconnect the power cord.

Cleaning the surface of the ultrasound system

CAUTION
Do not spray any liquid directly into the unit when cleaning the system.

1. Use a clean gauze pad or lint-free cloth, lightly moistened with a mild detergent, to wipe the surface of the ultrasound system. Take particular care to clean the areas near the trackball and the slide controls. Ensure these areas are free of gel and any other visible residue.
   Ensure that cleaning solution does not seep into the control panel, keyboard, or any other openings.
2. After cleaning, use a clean, lint-free cloth to dry the surface.
3. After cleaning, reconnect the power cord of the system into the power outlet.

Cleaning the liners of the transducer holders

1. Use the tab to remove the liner from the transducer holder.
2. Clean the liner under the running water, using a mild detergent and dry with a lint-free cloth.
3. Reinsert the liner into the transducer holder.

Cleaning the trackball

CAUTION
Do not drop or place foreign objects inside the trackball assembly. This may affect the trackball's operation and damage the system. Avoid other solvents that may damage the mechanical parts of the trackball assembly.

1. Remove the front panel bezel by rotating the bezel counter-clockwise.
2. Remove the trackball and the teflon ring.
3. Clean the trackball and the teflon ring with tissue and isopropyl alcohol.
4. Clean the inside of the trackball assembly with a cotton swab and isopropyl alcohol.
5. Allow the assembly parts to completely dry before the reassembly.
6. Replace the trackball and front panel bezel.

Cleaning the monitor face

Use a soft, folded cloth and a glass cleaner solution. Apply the glass cleaner to the cloth. Gently wipe the monitor face.

Do NOT use a glass cleaner that has a hydrocarbon base (such as Benzene, Methyl Alcohol or Methyl Ethyl Ketone) on monitors with the filter (anti-glare shield). Prolonged use of such cleaners will damage the filter (anti-glare shield). Hard rubbing will also damage the filter.

CAUTION

When cleaning the monitor, make sure not to scratch the monitor.

Removing and cleaning the air filter

The air filter on the ultrasound system must be cleaned regularly to maintain the proper system cooling. Remove and check the air filter weekly, and clean as needed.

CAUTION

Do not scrub, stretch, or bend the filter, or apply heat to the filter, as doing so could damage the filter.

1. Power off and unplug the power cord from the power outlet.
2. Grasp the air filter and pull it out of the system.
3. Rinse the air filter with running water and allow the filter to completely dry. To hasten drying, you may gently shake the filter, or blot the filter with a clean, lint-free cloth.
4. Reinsert the filter into the ultrasound system.
5. Plug the power cord into the power outlet.

Battery Care and Maintenance

The battery is a consumable item. The battery will gradually lose its capacity for charging after repeated use and after time has passed. Alpinion Medical Systems recommends that you replace the battery once in one year or after 500 recharging cycles, whichever comes first.

NOTE

- For the replacement or disposal of the battery, contact an authorized agent or an ALPINION MEDICAL service engineer.
- The warranty period for the battery is six months.

Recharging the Battery

Connecting AC power automatically begins charging the battery. To charge the battery faster, please power off the system.

CAUTION

Do not recharge the battery using a non-recommended method, as this may cause an explosion or a fire.

The battery that are not used for several weeks at a time should be recharged at regular intervals. Alpinion Medical Systems recommends that you recharge the battery every 1 or 2 months even without use.

The battery must be charged and discharged within the following temperature ranges:

State	Ambient Temperature
Charging	0 – 45 °C
Discharging	-10 – 60 °C

Storing the Battery

The battery must be stored within the following temperature ranges:

Period	Temperature
Less than 1 month	0 – 60 °C
1 – 3 months	0 – 45 °C
4 – 12 months	0 – 23 °C

Disposing of the Battery

This system uses lithium ion batteries. Used battery must be discarded as chemical waste. An authorized agent or an ALPINION MEDICAL service engineer must replace and dispose of the battery.

WARNING

Do not incinerate the battery, as this may cause an explosion or a fire.

Transducer Care and Maintenance

It is the responsibility of the user to verify that the transducer is safe for diagnostic operation. After each use, inspect the transducer's lens, cable, and casing. Look for any damage that would allow liquid to enter the transducer. If any damage is found, do not use the transducer until it has been inspected and repaired/replaced by ALPINION Service Representative.

WARNING

Always place a sterile, non-pyrogenic transducer sheath on a transducer used in procedures requiring sterility.

WARNING

There have been reports of severe allergic reactions to medical devices containing latex (natural robber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly.

WARNING

During neurosurgical procedures, if a transducer becomes contaminated with tissue or fluids of a patient known to have Creutzfeld-Jacob disease, the transducer should be destroyed, as it cannot be sterilized.

WARNING

When using an endocavity transducer with a CF type applied part, the patient leakage currents may be additive. Prior to each use, the leakage current test must be done.

WARNING

To avoid electrical shock and damage to the system, disconnect the transducer prior to cleaning or disinfecting.

WARNING

The list of disinfectants and cleaning methods are recommended by ALPINION for the compatibility with product materials, not for the biological effectiveness. Refer to disinfectant label instructions for the guidance on disinfection efficacy and appropriate clinical uses.

CAUTION

Transducers are sensitive instruments – irreparable damage may occur if they are dropped, knocked against other objects, cut, or punctured. Do not attempt to repair to alter any part of a transducer.

CAUTION

To avoid cable damage, do not roll the system over transducer cables.

CAUTION

To avoid damage to the transducer, do not use transducer sheaths containing on oil-based coating or petroleum-or mineral oil-based ultrasound coupling agents. Use only a water-based ultrasound coupling agent.

CAUTION

DO NOT place or store the transducer in the side pocket or the storage area on the system to prevent damaging it from accidently falling off.

CAUTION

To avoid damage to the transducer, observe the immersion levels indicated for each transducer type. Do not immerse or allow the cable or connector of a transducer to become wet. See "Transducer Immersion Level" on page 13-14 for more detailed information.

CAUTION

The transducer have been designed and tested to be able to withstand high-level disinfection as recommended by the manufacturer of the disinfectant product. Carefully follow the disinfectant manufacturer’s instructions. Do not immerse for more than one hour.

Transducer Handling and Infection Control

This information is intended to increase user awareness of the risks of disease transmission associated with using this equipment and provide guidance in making decisions directly affecting the safety of the patient as well as the equipment user.

Diagnostic ultrasound systems utilize ultrasound energy that must be coupled to the patient by direct physical contact. Depending on the type of examination, this contact occurs with a variety of tissues ranging from intact skin in a routine exam to recirculating blood in a surgical procedure. The level of risk of infection varies greatly with the type of contact.

One of the most effective ways to prevent transmission between patients is with single use or disposable devices. However, ultrasound transducers are complex and expensive devices that must be reused between patients. It is very important, therefore, to minimize the risk of disease transmission by using barriers and through proper processing between patients.

Proper cleaning and disinfection between patient cases are necessary to prevent disease transmission. All transducers must be thoroughly cleaned prior to disinfection. The level of disinfection required depends on the degree of patient contact.

- The transducers that contact mucous membranes (e.g., Endocavitary, Transesophageal) or non-intact skin require cleaning followed by High-Level Disinfection either soaking or use of a trophon® EPR or V-PRO.
- The transducers that contact intact skin require cleaning followed by Intermediate-Level Disinfection (wipe or spray).

NOTE

- To verify transducer chemical compatibility, please refer to "List of Compatible Disinfectants and Cleaning Solutions" on page 13-15.
- The latest full list of compatible cleaning solutions and disinfectants tested is available at the ALPINION MEDICAL SYSTEMS Resource website (http://www.alpinion.com).

Cleaning and Disinfecting Transducers

All transducers must be cleaned and disinfected after each use. Cleaning is an important procedure that must be carried out before disinfecting the transducer. For cleaning and disinfecting the transducer, carefully follow the proper disinfectant and disinfectant method recommended by ALPINION MEDICAL SYSTEMS. Using an inappropriate cleaning or disinfecting agent may damage the transducer.

WARNING

- To avoid electrical shock and damage to the system, disconnect the transducer before cleaning and disinfecting.
- Always use protective eyewear and gloves when cleaning and disinfecting transducers.
- Check the housing, strain relief, lens and seal for damage, and check for any functional problem after cleaning and disinfecting the transducer.

CAUTION

- Do not use a surgical brush when cleaning transducers.
- Do not use a cleaning brush when cleaning the transducer lens. Even the use of soft brushes can damage the transducer lens.
- Do not use paper products or products that are abrasive when cleaning the transducer. They damage the lens of the transducer.
- Be sure to use the proper concentration of enzymatic cleaner and rinse thoroughly.
- Before storing transducers, ensure that they are thoroughly dry.
- The use of 70% isopropyl alcohol (rubbing alcohol) and alcohol-based products on all transducers is restricted. On non-TEE transducers, the only parts that may be cleaned with isopropyl alcohol are the connector housing and the transducer housing and lens. Do not wipe any other part of a transducer with isopropyl alcohol (including cables or strain reliefs), as it can damage those parts of the transducer. This damage is not covered by the transducer warranty.

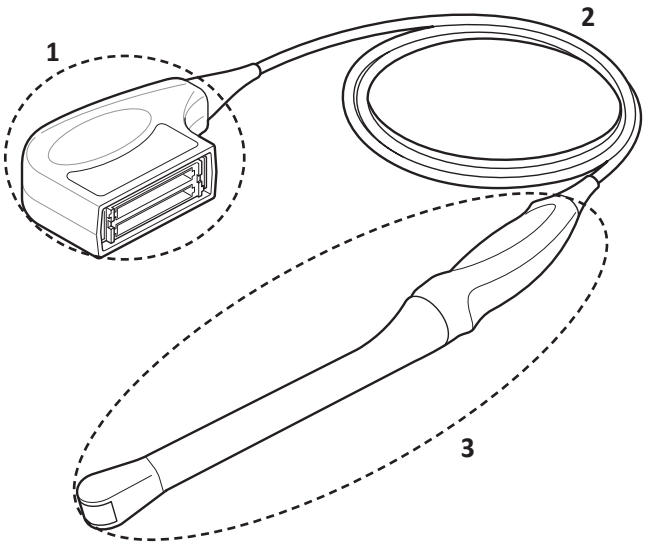


Figure 13-1 Cleaning/Disinfection of Transducer Components

No	Component	Description
1	**Connector housing**	Cleaning only
2	**Transducer cable**	Cleaning only or cleaning and disinfection
3	**Transducer housing, Lens**	Cleaning followed by appropriate level of disinfection

Cleaning the transducer

Cleaning is an important procedure that is carried out before disinfecting the transducer. The transducer must be cleaned after each use.

1. Disconnect the transducer from the system.
2. Moisten a clean gauze pad with purified water and wipe the transducer to remove any gel or particles remaining on the transducer. If purified water is not effective, then you can use an approved pre-cleaner or low-level disinfectant such as wipe or enzymatic detergent. Follow the solution manufacturer's instructions for the cleaning of transducers.
3. Carefully wipe the entire transducer, including the cable and connector.
   When cleaning the connector, do not allow any type of fluid to enter through the connector strain relief, electrical contacts or areas surrounding the locking-lever shaft and the strain relief.
4. To remove remaining particulate and cleaning residue, use cleaning wipes according to the manufacturers' instructions, or rinse thoroughly with water up to the immersion point.
   Do not immerse the connector, connector strain relief, or cable that is within 5 cm of the connector strain relief.

   NOTE

   If you place the transducer into the water or cleaning solution, make sure not to immerse the transducer into the liquid beyond the immersion level. See "Transducer Immersion Level" on page 13-14 for more information.
5. If remaining particulate and cleaning residue have dried onto the transducer surface, scrubbing with a soft bristle brush may be necessary.

   NOTE

   Do not use a cleaning brush when cleaning the transducer lens. Even the use of soft brushes can damage the transducer lens.
6. Dry the transducer using a sterile cloth or gauze after rinsing. Do not dry the transducer by heating it.

   NOTE

   To dry the lens, use a soft cloth and a blotting motion instead of a wiping motion.
7. Examine the housing, strain relief, lens and seal for damage, and check for any functional problem. If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

   NOTE

   The transducer is determined not to be visually clean at the end of the cleaning step, repeat the relevant previous cleaning steps of the transducer.
   In addition, if the visual inspection reveals unacceptable deterioration such as corrosion, discoloration, pitting, cracked seals, safely dispose of the transducer.

Disinfecting the transducer

WARNING

- If a pre-mixed solution is used, be sure to observe the solution expiration date.
- The type of tissue it will contact during use dictates the level of disinfection required for a device. Ensure that the solution strength and duration of contact are appropriate for disinfection.

CAUTION

- Only wipe the cable, strain relief and parts of the transducer. Do not wipe the connector of the transducer.
- Do not immerse transducers in a solution for longer than one hour, unless under disinfectant manufacturer's instructions.
- Using a non-recommended disinfectant or not following the recommended disinfection method can damage and/or discolor the transducer and will void the transducer warranty.

To intermediate-level disinfect a transducer,

1. Disconnect the transducer from the system.
2. Thoroughly clean, rinse, and dry the transducer.
3. After cleaning, choose a intermediate-level disinfection solution compatible with your transducer.
4. Intermediate-level disinfect the transducer by following the disinfection method recommended by the disinfection solution manufacturer.
5. After disinfecting, examine the housing, strain relief, lens and seal for damage, and check for any functional problem.
   If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

To high-level disinfect a transducer,

1. Disconnect the transducer from the system.
2. Thoroughly clean, rinse, and dry the transducer.
3. After cleaning, choose a high-level disinfection solution compatible with your transducer.
   If a pre-mixed solution is used, be sure to observe the solution expiration date.
4. Disinfect or high-level disinfect the transducer by following the disinfection method recommended by the disinfection solution manufacturer. High-level disinfection is recommended for general transducers and is required for endocavity transducers.

   NOTE

   If you place the transducer into the water or disinfection solution, make sure not to immerse the transducer into the liquid beyond the immersion level. See "Transducer Immersion Level" on page 13-14 for more information.
5. Rinse the transducer with plenty of sterile water to remove all chemical residues on it. Or follow the rinsing method recommended by the disinfectant manufacturer to rinse the transducer.
6. Wipe off the water on the transducer with sterile cloth or gauze after rinsing it. Do not dry the transducer by heating.
7. Examine the housing, strain relief, lens and seal for damage, and check for any functional problem.
   If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

Transducer Immersion Level

CAUTION

- Make sure not to immerse the transducer into any liquid beyond the immersion level specified for that transducer.
- Do not immerse the transducer connector and cable in liquid.

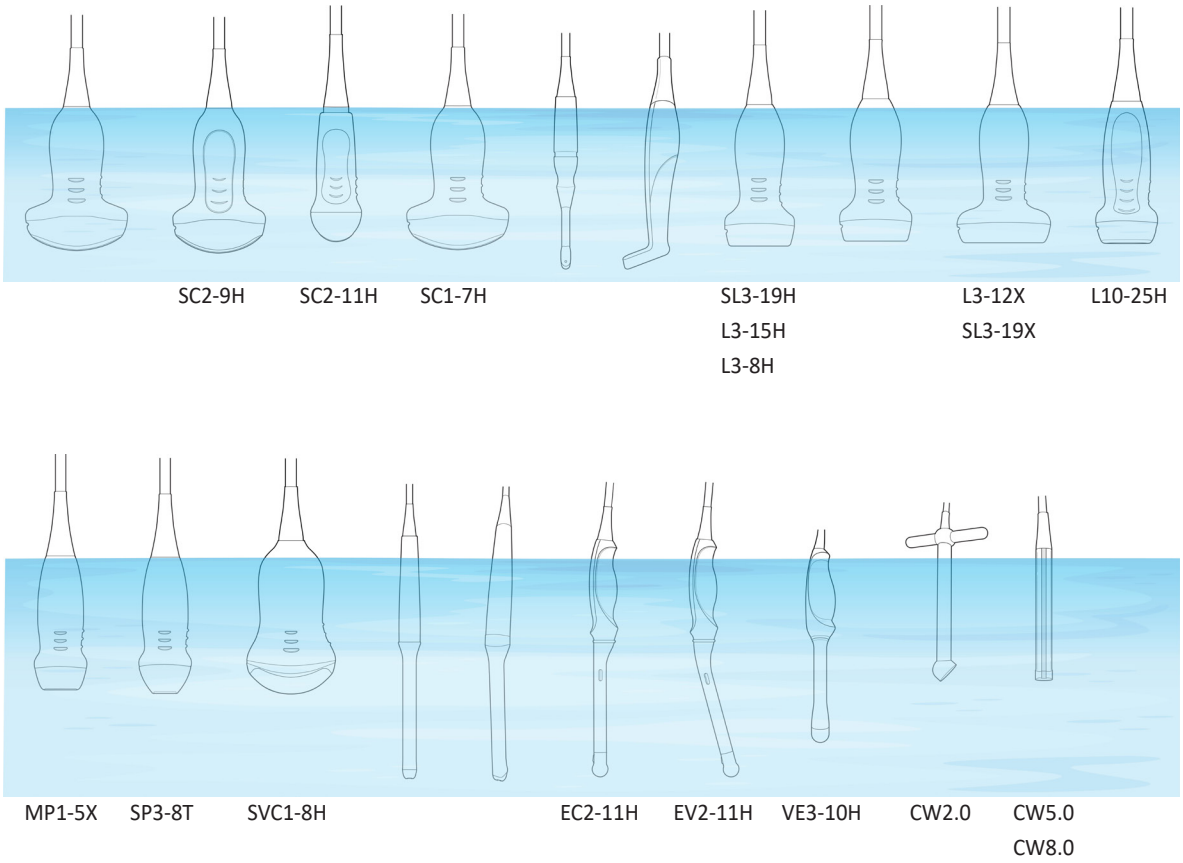


Figure 13-1 Transducer Immersion Level

List of Compatible Disinfectants and Cleaning Solutions

ALPINION MEDICAL SYSTEMS routinely reviews new cleaning and disinfection solutions for compatibility with the materials used in the transducer housing, cable and lens in order to provide users with options in choosing a cleaning or disinfection solution. Refer to Resource on website (http://www.alpinion.com) for the latest list of compatible cleaning solutions and disinfectants.

Storing the Transducer

It is recommended that all transducers be stored in the provided carrying case.

To store the transducer in the carrying case,

1. Place the transducer connector into the carrying case.
2. Carefully wind the cable into the carrying case.
3. Carefully place the transducer head into the carrying case. DO NOT use excessive force or impact the transducer head.

Storage/Transportation

It is recommended that each transducer should be placed in each own transducer holder on the console. If the carrying case is provided with the transducer, always use the carrying case to transport the transducer from one site to another.

Secure the transdcuer in its holder for moving short distances.

When transporting a transducer a long distance, store it in its carrying case.

Cable Handling

Take the following precautions with transducer cables:

- Keep free from wheels
- Do not bend the cable acutely
- Avoid crossing cables between transducers

Planned Maintenance

The following maintenance schedule is suggested for the transducer to ensure the optimum operation and safety.

- Daily: Inspect transducers
- After each use: Clean transducers
- After each use: Disinfect transducers

14

Appendix

This chapter describes followings:

Appendix A. Biopsy Guide

The system supports biopsy capability for the transducers listed in the table below.

Biopsy Guide	Transducer	Type	Dimension	Manufacturer
L3-12 Biopsy	L3-8H L3-15H SL3-19H	Multi-angle	90.5(W)×48.3(D)×22.9(H) mm	CIVCO Medical Solutions
L3-12X Biopsy	L3-12X SL3-19X	Multi-angle	109.2(W)x45.0(D)x30.5(H) mm	Aspen Surgical Products, Inc.
SC1-6 Biopsy	SC1-7H	Multi-angle	106.7(W)×55.8(D)×27.9(H) mm	CIVCO Medical Solutions
EV2-11H Biopsy (Reusable)	EV2-11H EC2-11H	Single-angle	150.92(W)x26.81(D) mm	Aspen Surgical Products, Inc.
VE3-10H Biopsy (Disposable)	VE3-10H	Single-angle	148.3(W)x35.5(D) mm	Aspen Surgical Products, Inc.
VE3-10H Biopsy (Reusable)	VE3-10H	Single-angle	142.4(W)x40.9(D) mm	Aspen Surgical Products, Inc.

WARNING

The biopsy option is intended for use by a duly licensed physician who has received the appropriate training in biopsy techniques as dictated by current relevant practices, as well as in proper operation of the ultrasound unit.

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Biopsy Starter Kit for Linear and Convex Transducers

Convex and Linear transducers have an optional biopsy kit specific for each transducer. The biopsy kit consists of:

- A reusable non-sterile bracket
- Disposable sterile Ultra-Pro II™ Needle guide kits (CIVCO Medical Solutions) consisting of:
  - Sets with needle inserts covering gauge size 14 through 23 (2.1 mm to 0.6 mm)
  - Sterile sheath
  - Rubber bands
  - Gel
- Instructions

In addition sterile Ultra-Pro II™ Needle guide kits can be ordered as replacement kit.

WARNING
Read the instructions and the user's guide for the Ultra-Pro II™ Needle guide kits before using the biopsy equipment.

Biopsy Starter Kit for Endocavity Transducers

The endocavity transducer has an optional specific biopsy kit. The biopsy kit consists of:

- Disposable sterile needle guide/ Reusable non-sterile needle guide
- Sterile sheath
- Rubber bands
- Gel
- Use Instructions for Disposable Endocavity Needle Guide/ Use Instructions for Reusable Endocavity Needle Guide

In addition disposable sterile endocavity needle guide can be ordered as replacement kit.

WARNING
Read the instructions for the Disposable/Reusable Endocavity Needle Guide from Aspen Surgical Products, Inc. before using the biopsy equipment.

Appendix B. IPX8 Immersion Levels

CAUTION

To avoid damage to the transducer, observe the immersion levels indicated for each transducer type. Transducers with the protection level IPX8 are indicated by the presence of the “IPX8” symbol on the connector of the transducer.

Transducers meet Ingress Protection IPX8 of EN 60529 and IEC 60529 to the depth of the immersion line shown in the illustration only for transducers with the “IPX8” symbol on the connector of the transducer.

NOTE

Test Standard of IPX8:
Immersion for 90 minutes at a depth of 1 meter.

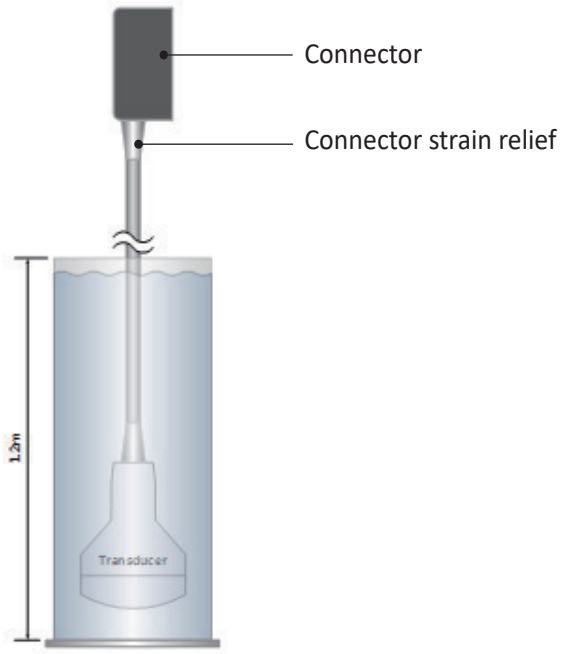

Figure 14-1 IPX8 Immersion Level

Appendix C. Copyrighted Third Party Software License Information

X-CUBE 70 contains copyrighted material.

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